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GOVERNMENT OF INDIA
MINISTRY OF AGRICULTURE

A NOTE ON PROBLEMS OF CROP INSURANCE UNDER INDIAN CONDITIONS

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P R E F A C E.

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In the following pages are presented the results of an investigation into the problem of Crop Insurance in India which I undertook on the 10th August 1948, as an Officer on Special Duty for Crop & Cattle Insurance in the Ministry of Agriculture. In connection with Crop Insurance the terms of reference for the appointment state that the officer was to work out a detailed experimental scheme for crop insurance in respect of selected crops in selected areas so as to provide reliable data on the basis of which more comprehensive schemes could be drawn up later. The present note must be considered as only an interim report, since I have not so far reached a stage where I could present a pilot scheme of Crop Insurance complete in all essential details. Nevertheless, in view of the nature of the problem I believe that a preliminary report at this stage defining a suitable line of approach to the problem in Indian conditions would be desirable, since it would serve as a basis for comments and criticism by competent persons on various aspects of the proposed scheme.

NEW DELHI,
15th April 1949.

G.S. Priolkar.

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SUMMARY.

CHAPTER I.

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A complete system of agricultural insurance should include insurance of cattle and insurance of periodic crops. Cattle form a major portion of the cultivator's working capital and a crop failure involves not only a loss of a season's family income but loss of capital invested in producing the crop.

Protection against the various types of crop hazards can be obtained through irrigation and through various other practices like growing mixed crops and disease resistant varieties, treating seed against disease, etc., which may be said to constitute self-insurance. But even with most efficient use of such devices the farmer's need for protection against crop hazards is great. However, until recently even in foreign countries the only type of insurance protection available was that against specific hazards, like fire, hail, windstorm and frost. A scheme of insurance affording protection against all hazards beyond the control of the cultivators has been in operation in the U.S.A. only since 1939 and still continues to be looked upon as being in an experimental stage.

Crop insurance is essentially more complex than other forms of insurance owing to varied forms of moral hazard and the need for individual supervision of the insured units which may be small and scattered: and to this must be added the difficulties created by the poverty and ignorance of the cultivator in India.

The insecurity in agriculture arises not only out of seasonal variation in yields but also as a result of variation in prices. Crop Insurance operates only against the former and for deriving full benefit from the scheme, a price support programme must be worked with it. The two programmes are complementary and each will facilitate the working of the other. However where the bulk of the produce is consumed by the cultivator himself or used in pay-

ment of goods and services a crop insurance programme will be valuable even by itself and will itself tend to stabilise prices.

The benefits of crop insurance are many and varied. It is much more than an equivalent of Unemployment Insurance since the loss of crop means not only loss of a season's income but impairment of farmer's ability to earn an income during following seasons. Also it is a form of Famine Insurance of a much more satisfactory kind than the present Government arrangements for relief and rehabilitation of the agriculturist during years of distress. It will remove a major cause of the indebtedness of the cultivator. It will help smooth working of institutions granting agricultural credit. By making investment in crops possible and safe it will promote intensive farming. It will provide an agency directly interested in plant protection. It will be also of great value to the community at large especially if worked with a price support programme. It will create a food reserve against years of scarcity; will promote stability of prices which will be beneficial to both the cultivator and consumer; and will help an even flow of raw material to industry and tend to stabilise cultivator's purchasing power.

In India there has been considerable demand for crop insurance from those who have given thought to the problems of agricultural reform. A demand for insurance protection on the part of the insured themselves will however need to be created.

It has been suggested that a scheme of crop insurance will not be workable in a small scale subsistence economy such as the Indian. This may be disputed. It is obvious that in such an economy/the need for insurance is larger and efforts for making thrift easy and attractive are all the more necessary. Further even in such an economy a majority of cultivators must be already meeting the impact of adverse seasons by either saving in advance or by incurring debts after the event and paying for them subsequently. Crop insurance is merely a more efficient and much cheaper way of

doing so which in addition brings advantages which result from saving on a collective scale. It is true, nevertheless, that in India greater effort will be needed to popularise the scheme and costs will be heavier. A simpler and safer contract will therefore be desirable.

Another consideration is whether Crop Insurance deserves priority in a programme of agricultural reform. The need for removing wide fluctuations in yields for helping production and productive efficiency in agriculture is admitted. In U.S.A. it has been recognised that Crop Insurance serves to fill an essential gap in a well-rounded programme of agricultural reform. Programmes which involve larger investment will not be successful if the risk of loss of investment is not provided against. The effect of Crop Insurance in promoting success of other complementary programmes has been indicated. It may also be remembered that a beginning will in any case have to be made on a limited scale.

It is also said that agricultural insurance is premature since social insurance for industrial population is yet to make a headway in India. There is no reason why industrial social insurance should precede agricultural insurance, irrespectively of the nature of a country's economy and in fact this has not been the case in many countries.

Crop Insurance may also serve as an attractive way of immobilising surplus purchasing power in the hands of cultivators and will thus help anti-inflationary policies.

The nature of the problems that must be considered in evolving a suitable scheme for Indian conditions may briefly be indicated as follows: First, in view of the ignorance and poverty of the cultivator in India and the small size of the cultivated unit, a simpler and safer type of contract than the one current in the U.S.A. will be desirable. Further, a compulsory scheme may be necessary to secure adequate participation and will substantially reduce costs which will be a major problem in India. The question

of the relative attractions of a voluntary and a compulsory scheme must be carefully considered. Thirdly, suitability of different agencies like a State Corporation, small local societies and private insurance companies must be considered. It will be remembered in this connection that the extensive land revenue agencies in India may themselves be considered to be operating a scheme of crop insurance in India, and it will be essential to integrate them in the administrative set-up of a scheme of crop insurance. Fourthly, the limitations of existing agricultural statistics will constitute a major problem and new techniques for utilising the available data may have to be evolved. Further, efforts to secure more adequate statistics in course of the normal working of the administrative machinery will be desirable. Lastly, in Indian conditions it may be necessary to consider a larger subsidy to the scheme, than is given in the U.S.A. The problem of the form and extent of such subsidy must be considered separately for the pilot scheme stage and the later more comprehensive stage.

After these problems have been solved, one may proceed with the detailed problems connected with the actual evolution of the scheme. It has been accepted that a beginning will have to be made with an experimental scheme on a limited but adequate scale. This will mean firstly, selection of crops to be insured; secondly, selection of the areas for operation of the scheme and their extent; thirdly, in case of a voluntary scheme, the need for minimum participation requirements; and lastly, evolution of a suitable administrative machinery for working the scheme.

These problems have been discussed in the Chapters that follow.

CHAPTER II.

APPROACH TO CROP INSURANCE UNDER INDIAN CONDITIONS.

All-risk Crop Insurance on a satisfactory basis may be said to have come into existence only in 1939 in the U.S.A. and even there it is recognised to be in an experimental stage. The types of contract as well as the form of organisation for its administration are therefore yet to be finalised and these will in any case have to conform to the conditions in various countries. Further, crop insurance is inherently intricate in its nature and "contains more complex problems than other types of insurance". Two features of a suitable approach to Crop Insurance in India follow from these considerations:

(a) Adequate preliminary study and research in relation to problems arising out of insurance of various crops in different localities must precede the inauguration of the scheme.

(b) In addition to this, a stage of experimentation on a limited but adequate scale in respect of each crop must precede a comprehensive scheme of Crop Insurance.

In a Crop Insurance scheme on the U.S.A. model premiums and insurance coverages relate to the experience of each individual farm; moreover, various factors such as the prevailing agricultural practices and their relative efficiencies, time-table of various operations during the life of a crop, costs of production at different stages of production, all enter into the form of contract. Local studies in respect of these in the areas of operation of the scheme will therefore be necessary in case a type of a contract similar to that current in the U.S.A. is used.

No amount of study and research can however provide essential information of certain types and for this actual experimentation is necessary. Certain forms of moral hazard and selectivity come to surface only in course of actual working, and through experimentation information can be obtained on the relative safety and popularity of various types of contract as well as the relative efficiencies and costs of various types of organisation. Approach through a pilot

scheme serves to limit the price at which such experience is bought it should be remembered, however, that experime-ntation must be on a scale extensive enough to provide reliable experience of problems of various areas. In India an experimental stage is all the more necessary because a beginning may have to be made with comparatively less satisfactory statistics than in the U.S.A., and more adequate data collected in course of the working of the scheme. The pilot scheme in India will also have as its objective the task of educating the cultivator into appreciation of the value of insurance by actual demonstration of its working as well as by effective publicity. It will also serve to train a nucleus of administrative personnel in various areas.

The following fundamental features of the U.S.A. scheme will have to be adopted:

(i) Insurance of yields and not value of crops. This is essential since experience has shown that prediction of prices is not feasible.

(ii) Extension of insurance from one crop to another.

The U.S.A. contract guarantees a proportion of the long term average yield of the crop against losses arising out of causes beyond the control of the insured, e.g., under the 75% level of coverage plan, the contract guarantees 75% of the average yield. In the event of the actual yield of the farm in any year falling below 75% of the average yield, as a result of insured causes, the difference is made good by an indemnity.

Two modifications of this contract are suggested for use in India. These may be described as follows:

In respect of a particular crop, a Condition Factor in any season for any area may be defined as the proportion of the actual yield during the season to the long term average yield of the area.

First Type of Contract -

(i) The contract may be based on the condition factor of the insured farm.

(ii) In the event of a complete crop failure in a season a maximum indemnity S may be guaranteed. In case the condition factor falls

below 75%, a fraction of this indemnity, proportional to the defect of the condition factor from 75% will be payable, e.g., if the condition factor is 50%, this fraction will be (75-50)/75 = ⅓ .

(iii) The maximum indemnity S may be limited to be not more than 50% of the average yield of the farm. For instance, contracts with S equal to 50% and 30% and 25% of the average yield may be allowed.

It will be easily seen that the U.S.A. contract results if S = 75% of average yield.

It will be noted that if the shortfall of the actual yield below 75% of the average yield be called the 'loss', the indemnity under the U.S.A. contract is equal to the 'loss' while the maximum indemnity under the suggested contract is equal to two-thirds of the 'loss'. Under the alternative contracts the indemnity will be equal to two-fifths and one third of the 'loss' respectively.

Under the U.S.A. plan no loss is involved to the cultivator if the cultivator lowers the condition below 75% by neglect or malfeasance and he may save costs as a result. Under the present plan a definite loss is involved. Thus the moral hazard is substantially minimised and the incentive to effort maintained. This may also limit the risk arising out of inaccurate statistics.

Second Type of Contract -

(i) The contract may be based on the Condition Factor of an 'area' in which the farm is situated.

(ii) In the event of a complete crop failure in the 'area' a maximum indemnity S may be guaranteed to the insured cultivator. In case the 'area' condition Factor falls below 75% a fraction of this sum proportional to the defect of the Condition Factor from 75% will be payable.

(iii) There is not the same need to limit the indemnity to 50% of the average yield as in the other type of contract. But 50% of the area average yield may be taken as the maximum limit for coverage.

Similar plans under which the indemnity is payable on Condition Factors falling below 50% may also be allowed.

Under contracts such as the first mentioned above, based on

the condition of the insured farm, considerable individual attention is necessary to avoid moral hazard, and 'neglect' must be defined in terms of actual agricultural practices. Crop loss adjustments must be made in respect of individual farms. The statistical basis consists of a record of yields of individual farms over a number of years.

Under the second type of contract, the indemnity will depend on the condition factor for the area which is easier to determine, and a machinery for determining it already exists. Problems and costs of individual farm loss adjustments will disappear. The incentive to effort will be maintained, since the indemnity will be an addition to and independent of the size of the produce of cultivator' s farm. This simplicity in working should prove of great value in India, where the small size of the holding, poverty and ignorance of the cultivator and wide variety of current agricultural practices will make the operation of the individual farm basis difficult and expensive. The existing statistics may also form a comparatively more satisfactory basis.

This plan will be equitable in the sense that over a term of years, the benefits obtained by the cultivator will be equivalent to premiums paid. However, since the indemnity depends on the average condition of the crop in the area and not of the farm itself, there will not be a complete conformity between the availability and size of the indemnity and the needs of the farmer. Since, however, causes resulting in losses of an extent needing indemnification will be widespread in operation, substantial conformity may be expected.

The 'area' on whose condition factor the indemnity is to depend should be made as homogeneous as possible with a view to ensuring substantial conformity between the experience of the individual cultivator and that of the area. For this purpose it is suggested that each centre may be divided into grades of soil according to revenue soil classification. Also factors like irrigation, variety sown, etc. may be taken into account.

For ensuring further conformity of the benefit to the need of the cultivator the benefits available on the basis of the condition of the area in the event of 'general calamities' may be supplementd by benefits depending on condition of each holding in the event of 'local calamities' like hail, flood, locusts, etc. as is in fact done in connection with the procedure for remission and suspension of land revenue. Moreover, certain high risk farms may be declared uninsurable as in the U.S.A.

The revenue agencies are in fact operating a crop insurance scheme on these lines in their machinery for remissions and suspensions. The revenue machinery could be directly utilised for crop loss adjustment. But a more objective procedure which may replace the present duties of revenue staff will be desirable. It must be remembered that a procedure of adjusting loss in case of a contract of the U.S.A. type must be comparatively more difficult in India in view of the small insured unit. A suitable procedure for crop loss adjustment would be a crop cutting survey on principles of random sampling intended to produce estimates of yields per acre for each area with a sampling error of 2 to 3%. The work need not be undertaken in obviously good seasons and in course of time could be entirely assigned to revenue agencies. But during the pilot scheme stage a full scale survey may be undertaken every year and the work of patwaries very adequately supervised. Possibilities of eye estimation should be studied in connection with such surveys and these may enable eventually a reduction in the extent of crop cutting. In connection with such surveys ancillary information on a wide variety of factors which enter into crop insurance contract could be easily obtained.

In case of a voluntary scheme, it will not be advisable to withhold from the insured the benefits of land revenue remissions and suspensions during bad seasons.

A policy should be issued to the person or persons who bear the impact of crop failure and in respect of the extent to which they bear the impact. Thus if a tenant pays a fixed rent, he may

be insured in respect of full value of the crop; if he shares the produce with the owner, each may be insured to the extent of his interest in the crop.

It may be possible to lay down that an insurance policy may be taken out before seeding the crop, but the premium may be paid after the insured crop is harvested. Any unpaid premiums could perhaps be collected as arrears of land revenue.

A long term contract under a voluntary scheme has considerable advantages in that it will preclude certain forms of selectivity. The question of giving rebates in the premiums payable in case contracts are continued from year to year may be considered.

An investment Insurance Plan in India, while simpler in certain ways, will present difficulties in operation until a price support programme comes into operation.

CHAPTER III.

RELATIVE ADVANTAGES OF A VOLUNTARY AND A COMPULSORY SCHEME.

Before considering the details of a suitable scheme, it will be necessary to decide as to whether to make it voluntary or compulsory. There are strong arguments on either side.

The main argument for a voluntary scheme is that the compulsion to pay premiums under a compulsory scheme may be resented as additional taxation; and a feeling of unfair discrimination may result as the scheme is to be limited to a few areas and crops. Even a compulsory scheme will have to take into account the ability of the marginal cultivator to pay premiums, by severaly limiting benefits under the scheme and/or limiting compulsion to certain strata Experimentation with various plans will be more natural under a voluntary scheme and it will be easier to operate even in high risk areas.

On the other hand there are strong arguments in favour of a compulsory scheme. Certain types of selectivity against the insurer will be eliminated and the actuarial basis rendered more satisfactory by a compulsory scheme. A more complete pooling of risks between high risk and low risk farms may be feasible. Also costs will be lower, since costs of selling insurance will be avoided, and owing to concentration of the insured units in the areas of operation certain costs will be reduced.

The decision may depend on the crucial consideration whether a sufficient minimum participation to make the experience from the pilot scheme valuable and commensurate with the costs of the scheme, will be possible without compulsion. The answer may vary according to local conditions and there seems to be no reason for strict uniformity in different areas.

It is suggested that opinions of persons with experience of local conditions may be sought on this question.

A compulsory scheme of all risk Crop Insurance has been in operation in Dewas Junior State since 1943. Under this Crop Insurance has been extended to most major crops and both premiums and

indemnities expressed in terms of cash. The benefits vary slightly with the crops. But broadly speaking compulsion applies in respect of a premium equal to about 1/8th of the land revenue and this assures a maximum indemnity in case of a complete crop failure of about the size of the land revenue assessment. The administrative machinery is integrated with the land revenue machinery.

In view of the great advantages of a compulsory scheme, the experience in course of the operations of the pilot scheme will be of greater value if at least a part of the scheme is on a compulsory basis. In this connection, the following suggestions may be made:

(1) In certain areas protected by irrigation or having an assured rainfall large crop losses will be infrequent and inspite of the low premiums the cultivator may not find insurance attractive. Further in irrigated areas the revenue assessment will be larger and the crop insurance premiums will form a small fraction of these. Compulsory insurance may be tried in such areas.

(2) Compulsion may be extended only to a small fraction of the maximum permissible benefits such as one-half and the cultivator may be permitted to supplement this by voluntary insurance. This will further limit the size of the premium.

(3) Compulsion may only apply to holdings larger than a prescribed size.

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CHAPTER IV.

SCOPE OF THE PILOT SCHEME FOR CROP INSURANCE.

The next step in formulating a scheme may be to define its scope.

First a few crops may be selected. It is suggested that in spite of the comparatively smaller acreage under commercial crops, two such crops may be selected, in view of the importance of the crops in Indian economy and considerations like size of investment in the crop, and cultivator's ability to pay premiums.

It is suggested that insurance may be offered in respect of the following: Rice, Wheat, Cotton and Sugarcane.

Next, suitable areas may be selected, keeping the objectives of the scheme in mind. The value of the experience under a Pilot Scheme will depend on its utility for extension of the scheme.

In selecting areas, the following criteria may be of value.

(1) Selected areas should be broadly representative of the various producing areas as regards factors affecting productivity and production risks. Incidentally this will improve the workability of the scheme of spreading risks over a wider area;

(2) availability of basic statistics;

(3) availability of suitable agencies which could be utilised for administration of the scheme;

(4) existence of other conditions favourable for success of the scheme, e.g, general economic well-being and extent of education and progressive outlook of the cultivator and co-operation from official and non-official leadership.

In view of these it is suggested that the permanently settled areas may have to be excluded in the first instance; also East Panjab may be excluded in view of the present unsettled conditions.

It is suggested that these criteria will be broadly satisfied, if (1) insurance is confined to the major producing provinces in respect of each commodity and (2) to regions of concentrated production of the commodity in such provinces. (3) Further, the selections of actual localities may be effected in consultation with local authorities in the light of above considerations.

The next problem will be to define the total extent of the area of operation in respect of each commodity and its distribution over various provinces.

It will be convenient to define areas in terms of suitable administrative units. Since (1) the existing statistics relate to such units and (2) it may be desirable to utilise the existing administrative agencies for administration of the scheme. It is suggested that a firka will be a unit of suitable size for this purpose.

As regards the question of the desirability of prescribing a minimum limit as in the U.S.A. to the degree of participation in a unit area before insurance is offered, it is suggested that in view of the objects of the pilot scheme in India such rigid limits will be neither desirable nor feasible.

It is suggested that a maximum limit of about 20 firkas in respect of each commodity may be suitable.

These may be distributed over the provinces broadly in proportion to the relative proportions of the acreage under the commodity in each province, but allowance may be made for the homogeniety of the regions of production in each province, and the total scope of Crop Insurance operations in the province.

Assuming that the permanently settled areas and East Panjab are excluded, as suggested above, the following distribution showing the number of firkas that may be selected in the various provinces in respect of various crops may perhaps be found acceptable:

	Provinces.			
Commodity.	Madras	Bombay	United Provinces	C.P. & Berar.
Rice	12	--	4	4
Wheat	--	--	12	4
Cotton	4	8	--	6
Sugarcane	--	--	10	--

As indicated above, provincial authorities may be asked to select suitable areas in their respective provinces on the basis of the considerations stated above.

CHAPTER V.

ORGANISATIONAL SET - UP FOR CROP INSURANCE.

The next step may be to suggest suitable administrative agencies for operating the scheme. A consideration of the comparative suitability of the state, local bodies like co-operative societies and private insurers for the administration of the scheme shows that in its experimental stage at least the scheme will have to be entirely state-managed. The complex problems in the administration of crop insurance as well as the scale of operations necessary even for a moderately successful programme will seem to put Crop Insurance beyond the scope of our co-operative system at least in the immediate future. However, co-operative societies may be utilised for publicity and for selling insurance etc.

For help in the working of a State-managed scheme, there are at present two field agencies available in the various temporarily settled provinces, viz. the field agencies of the Revenue Departments and the field agencies of the Agricultural Departments. It is suggested that in view of the fact that the more extensive revenue agency is already concerned with the performance of functions comparable to certain operations in crop insurance administration and in view of its farm to farm knowledge and preoccupation with crop conditions, it will be more suitable for the purpose. The Agricultural agency could help in publicity and in study and research in various areas.

The following form of organisation is therefore suggested for the Pilot Scheme:

(a) The revenue agencies in the provinces may be allotted the following functions:

Patwari: Selling insurance, receiving premiums, checking acreages routine inspections, receiving notices of losses.

Part of the work could be integrated with Patwari's normal routine and in case of a voluntary scheme, which may mean only a few policies in each village, he could do the work together with his other work.

The Revenue Inspector - The responsible work of loss adjustment, inspections for that purpose and for release of acreages, etc.

It is suggested however that it will be advisable to put a Crop Insurance Assistant in charge of each centre in each province and he may be made responsible for the work of Crop loss adjustment as well, with the assistance of the Revenue Inspector. The Crop Insurance Assistant will in addition to planning the loss adjustment work, be responsible for the organising and clerical work, in respect of the centre assigned to him and will also organise collection of necessary statistics. In case of Crop insurance based on the condi-tion of an area, a crop cutting survey has been suggested; the work of the supervisory staff engaged for this purpose during theharvesting season will be planned and co-ordinated by this officer. In course of time, the extent of supervision could be reduced and work of sample harvesting as well as a good deal of the clerical work assigned to the Patwari.

The Crop Insurance programme in each province will be the responsibility of a Provincial Crop Insurance Officer. He will, with the assistance of the Crop Insurance Assistants and suitable clerical staff, organise selling of insurance, maintain records, receive premiums and keep accounts, process claims, organise the work of crop loss adjustment and supervi-se work at all levels. He will also collect statistics as required.

There will be a Central Office to whom the Provincial Crop Insurance Officers will be responsible. Here plans of insurance and suitable actuarial basis will be evolved and modified; insurance coverages and premium rates for various crops and areas determined; statistics collected and analysed; working of the scheme reviewed and general matters of policy including decisions about the scope of the scheme determined.

It is clear that a compulsory scheme would be much less expensive in relation to the extent of insurance since a larger part of the costs would remain practically unaltered inspite of the greater participation. The only addition necessary will be

in respect of clerical assistance in each centre, which perhaps could be reduced by making the Patwari responsible for a greater part of clerical work.

In additon to the paid staff, it will be advisable to have Advisory Committees consisting of officials and non-officials in each centre and also at the Provincial level. Further, there will be a managing committee to guide policies at the centre.

CHAPTER VI.

ACTUARIAL BASIS FOR CROP INSURANCE IN INDIA.

A new method for calculating premiums for Crop Insurance which, it is believed, may have certain advantages over the method current in the U.S.A. has been suggested. This is based on the assumption that the seasonal variations from the average yield are normally distributed. The method takes into account every variation in yield while the U.S.A. method takes into account only such large deviations in yields as call for an indemnity payment. The method therefore may be expected to yield stabler estimates of premium rates, which will depend to a lesser extent on the actual period to which the data relates; and may be useful when data are available for short periods. Further it will facilitate a distinction being made between accidental variations in premiums and those resulting from a real difference in seasonal variability. In the resulting formula, the premium rates for unit yield can be expressed as soon as the coefficient of variability is known and the actual premium will then be obtained by combining this with an appropriate estimate of average yield. This will enable allowance being made easily for different factors which affect productivity and will enable data from different sources to be combined.

Under a contract of the type current in the U.S.A. a close approximation to the yield of the insured farm is essential for the very feasibility of the contract. An over-estimation of yields will increase moral hazard and will lead to too large indemnities being paid too often. On the other hand seasonal variability only affects premiums and any errors in the estimate will only influence the cost to the insurer. The data required to serve as a basis for insurance must therefore provide a criterion for separation of each tract into 'homogeneous' areas in which a uniform yield could be [illegible]. It must also afford a basis for estimating the co-efficient of variability on which to base premium rates. A record of yields over a long period of a representative sample of key farms if [illegible] tract may serve each of these purposes. In addition, since

the amount of insurance increases according to the stage in crop production reached when the loss occurs, so as to reflect the investment in the crop upto that stage, data of costs of production corresponding to different stages of production are also required.

There are three sources of agricultural statistics in India which may be utilised for purposes of Crop Insurance. First, the official statistics. These consist of area statistics which are obtained by a plot to plot enumeration and are believed to be remarkably accurate; figures of normal outturnper acre for each district or taluk which are revised quinquennially and seasonal factors which express the seasonal condition of each crop in each unit like village, revenue circle, taluk, etc. in terms of the normal condition of the district. Only the district figures are published. Second, the yield data obtained in connection with the crop-cutting survey of yields on random sampling principles carried out in most provinces since the last 6 years. These surveys are intended to produce yield estimates for the province as a whole with sampling errors of 1 to 2% and therefore figures for smaller areas contain much larger sampling errors which will render year to year comparisons difficult. Further the data are available only for a short period, in no case more than 6 years. Third, data of yields derived from agricultural stations in the various provinces. These stations are very few in number but they are situated in typical areas and the data may be available for a considerable period of years.

For purposes of crop insurance a basis is required for estimates of long term average yields and of seasonal variability.

The average yields from agricultural farms relate to individual farms but they cannot be considered as representative of the yields on the average cultivator's farms. The yield data from other sources refer to larger areas and the crop cutting survey data to a small period of years. In the circumstances the best course would appear to be to obtain estimates of long term average yields for an area like a taluk on the basis of official statistics and crop-

cutting surveys and then to adjust these for factors like soil class, variety, irrigation etc. The 'areas' may be based on such classification. A promising basis for soil classification would be the land revenue soil classification.

For estimates of coefficients of variability, the seasonal factor data would be suitable if it were reliable; although it would refer to a village as the smallest unit, except in Madras where it is understood to refer to individual holdings. But these data are known to be subject to errors due to bias in various forms and investigations indicate that they might understate the seasonal variability very substantially. The data from crop cutting surveys relate to too small a period. It will therefore appear that data of yields of agricultural farms will have to be depended upon for estimating seasonal variability. The coefficients of seasonal variability so derived may be increased slightly for safety and to allow roughly for the greater care and resources with which cultivation is done on agricultural farms.

It is suggested therefore that for purposes of premium calculations, the coefficient of seasonal variability, derived from agricultural stations and suitably loaded, may be utilised in combination with estimates of average yield relating to each homogeneous 'area'. Certain data that has been investigated shows the existence of considerable stability in the coefficients of variability of each crop in each region and it would appear feasible to permit a uniform premium rate in each region.

For other auxilliary statistics relating to effect of various factors on productivity, costs at different stages of production of various crops in each area, time table of crop production etc., local studies may be carried out in each area. For this the ancillary information obtained in connection with crop cutting surveys will be of great value. Also data will be available from agricultural farms, settlement reports, Gazetteers, etc.

In course of the actual working of the scheme an effort will have to be made to collect more adequate statistics for refining

the statistical basis of the scheme. For this purpose data of yields from a randomly selected set of key farms may be collected, and it will be useful to supplement this by actual sample harvesting of a sub-sample out of these. In case of a type of contract based on the condition of an area, a crop cutting survey to determine the average yield in each centre has been suggested; and this will automatically provide the statistics as regards yields, which may be supplemented by other ancillary statistics. Also eye estimates may be obtained of the yields of the sample harvested plots just before harvesting and these may provide a basis for studying the accuracy obtainable by eye estimation.

CHAPTER VII.

A SCHEME OF CROP INSURANCE FOR C.P. & BERAR.

In this chapter the various principles and methods outlined in the earlier chapters have been applied to conditions in C.P. & Berar.

In C.P. and Berar there are well-marked regions in which cotton, wheat and rice are respectively the major crops. Data of yields of government agricultural farms and 'the seasonal factors' which form part of the official statistics have been analysed. The investigationsshow that the seasonal factors tend to substantially understate the coefficient of variability of yields and therefore the premiums based thereon would be lower than are necessary. The coefficients of variability obtained from the agricultural stations indicate the presence of considerable stability in the seasonal variation in respect of each crop in each region and it seems therefore that a uniform premium rate in respect of each crop in each region may be feasible. The seasonal variability in the yields of agricultural farms for cotton, wheat and rice may be taken as 35%, 30%, and 23% respectively. It has been suggested that premium rates for average cultivator's holding may be based on coefficients of variability equal to 40%, 35%, and 30% respectively in respect of cotton, wheat and rice. It is suggested that the average yields in each area of each class of cultivator's holdings based on soil-annawari, irrigation, etc. may be utilised in connection with the premium rates so obtained to obtain the actual premiums.

The figures for premiums and insurance coverages are arrived at primarily in terms of actual commodity but to facilitate comparison these have been expressed in terms of money, the prices used for wheat and rice being the average harvest price during 1942-43 to 1945-46 and for cotton harvest price during 1946-7. The values are however only illustrative. Further, they give only broad estimates of the average premiums and coverages in each region.

The contract may be described as follows:-

In each case if the short-fall of actual yield from 75% of the average yield is called 'crop loss', the indemnity is equal to

two-thirds of such 'crop loss'.

C O T T O N

Premium rate per acre	9.7. lbs. (Rs.2-4-0)
Maximum Indemnity	116.4 lbs. (Rs.25-8-0)

W H E A T

Premium rate per acre	13 lbs. (Rs.1-12-)
Maximum Indemnity	200 lbs. (Rs.27-0-)

R I C E

Premium per acre	13.4 lbs.(1-5-0)
Maximum indemnity	300 lbs. (Rs.36-0-)

It is found that in the rice region a large crop loss occurs only rarely; the need for insurance protection may therefore be less urgent and a voluntary scheme may not prove attractive. The following calculations are therefore made on the basis of insurance of cotton and wheat only.

The following areas are suggested for the operation of the Pilot Scheme:

Cotton - 2 Contiguous Revenue Inspector's Circles in each of the four Berar districts.

Wheat - 2 Contiguous Revenue Inspector's Circles in each of Saugor and Hoshangabad districts.

Selection of circles in which agricultural farms are situated may have certain advantages.

The scheme is intended to operate over a period of 5 years.

An idea of the extent of the operations of the scheme has been given on the assumption that on an average, 7% of the cultivated holdings might participate in the scheme during the quinquennium in which the scheme operates, and that the average area under the insured crop per holding will be 9 acres.

This is shown in the following table:

Commodity	No.of R.I. Circles.	No. of insurance contracts.	Acreage covered by insurance.	Annual premium income	
				Commodity	Value (Rs.)
Cotton	8	3,360	30,240	375 mds	67,460
Wheat	4	1,680	15,120	2390 mds	26,?00
	12	5,040	45,360	x	9?,?60

It is suggested that in view of the limited scale of operations the full machinery of commodity storage reserves may not be

considered necessary and that premiums and indemnities may be expressed in terms of cash equivalents, the Government bearing any additional liability caused by any adverse variation in prices.

In connection with the problem of a state subsidy to the scheme in addition to government paying the expenses of administering the scheme, the following considerations are relevant: It is possible to vary the amount of premiums payable by limiting benefits payable under the scheme in different ways. The question therefore depends not only on the ability of the cultivator to pay but on the relationship between premiums and benefits. The average premium per acre was nearly Rs.2-1-0 while in Berar district the average land revenue demand per acre was Rs.1-14-0. On the other hand the distinction between the Crop Insurance premium and land tax should be stressed. Crop Insurance premium leaves unaltered the net income over a period of years since the premiums paid are received back as indemnities. In fact crop insurance premium is only another way of meeting the impact of bad years which most cultivators are meeting even today. On the basis of such cost of production figures as are available, it does not appear that a crop insurance premium will prove too large a charge on the net income. However a basis for a subsidy may be suggested. An average premium has been suggested as appropriate to different farms. But for the most efficient farmers a premium comparable to that appropriate to agricultural stations would be suitable. If the difference is made good by a subsidy, this would mean that every farmer will get by way of indemnities at least the equivalent of his premiums. To ensure this a subsidy equal to 25% of premiums would be adequate.

In case of a type of contract based on the condition of an area, it is suggested that for purposes of crop loss adjustment a sample survey may be undertaken in each centre with a view to obtaining an estimate of yield per acre with a sampling error of 2 to 3%. Results of crop cutting surveys indicate that sample harvesting of 4 fields in each village in the cotton centres and 4 fields in half the number of villages in other centres may suffice for this purpose. This work could in course of time replace the normal routine of the

patwari; but during the pilot scheme stage it would be desirable to provide for very adequate supervision. It is suggested that for this purpose supervisors may be appointed during the harvesting season who would carry out 80% of the experiments themselves. They may be paid an honorarium of Rs.200/- each. These could be persons of standing recommended by popular bodies. The annual cost of the survey in C.P. and Berar may be Rs.14,000/-. In addition there will be non-recurring item of cost of Rs.4,800/- which will be necessary for supplying the equipment necessary for conducting the experiments.

It is suggested that a Crop Insurance Officer will be in charge of the operations of the scheme in the province. He will have a staff of one typist, one clerk and one peon at the provincial headquarters; in addition, there will be four Crop Insurance Assistants who may be stationed in the respective centres and given the help of a peon each . The total cost of their salaries and allowances would be nearly Rs.18,800/-. In addition there will be other items of expenditure such as commissions, which may be taken as one anna in each rupee of premium income, printing and publicity etc. The total expenditure under these heads may be taken as nearly Rs.7,400/-.

The total annual costs of administration of the scheme in the province will therefore be nearly Rs.40,000/-.

It is clear that since the Crop Insurance calculations visualise a balance between premiums and indemnities over a long period operating deficits may result from the operation of even a perfectly sound scheme during a quinquennium. To obtain an idea of the maximum ration that indemnities could reasonably speaking bear to the premiums, the experience of the period since 1931 has been considered, on the basis of the seasonal factors and the agricultural farm data. It is found that if the scheme had operated during this period in no case would the indemnities be larger than twice the premiums in any quinquennium. During the only other independent quinquennium, during which there would be an operating loss the indemnities would be 1.2 times the premium income.

Suggestions are also made for a compulsory scheme. In particular

it is suggested that a compulsory scheme may be tried in areas in the rice region even if a voluntary scheme operates elsewhere.

CHAPTER VIII.

In this chapter the ground covered in the foregoing chapters is briefly reviewed.

CHAPTER (1).

Introductory

Forms of Agricultural Insurance:

1. A complete system of agri cultural insurance should comprise insurance of the cultivator's capital equipment and insurance against the risk of loss or deficiency in the income from periodical crops.

As is well known cattle are the most valuable part of the Indian cultivator's working capital and provide power for agricultural operations, manure for the crop, and transport for the produce. Disease and pestilence play havoc among cattle with painful frequency and the need for replacement of cattle is one of the main sources of indebtedness. The importance of the problem has been recognised by Government by instituting a system of Takavi loans under which the cultivator can get advances from the state in periods of agricultural distress. Such measures however can only touch the fringe of the problem and Cattle Insurance will provide a much more adequate solution. Apart from the bullocks the other equipment of the agriculturist such as buildings, equipment, stores and seed are comparatively inexpensive and subject to slight risks of sudden loss of a serious nature.

The most important part of a scheme of agricultural insurance however relates to insurance of crops against unavoidable production risks. A serious deficiency in the income from the crops means not only loss of family income and the wherewithal to pay fixed charges such as rent and taxes, but the loss of of capital invested inthe production of crops, which may represent a good part of the cultivator's past savings and even borrowed capital.

2. The production risks which a cultivator has to face are many and varied; and while his ability to face them is very limited, they are largely beyond his control. This has rendered the cultivator's lot full of uncertainties of all kinds Yields of his crops may be influenced by a variety of factors such as hazards depending on climatic conditions - such as shortage or excess or maldistribution of rains, hail, frost and cyclones-plant diseases and insect pests.

Evolution of All-Risk Crop Insurance.

3. To a certain extent protection against the operation of crop hazards can be obtained by means other than insurance. Irrigation can to a large extent offer security against the vagaries of the rain. The farmer can also obtain security against certain hazards by measures which may be described as self-insurance. The practice of growing mixed crops, such as wheat and gram, cotton and tur is widespread in India and affords protection on the principle that crop hazards may not affect all the components of the mixture to the same extent; selection of varieties maturing at suitable durations to avoid weather hazards or resistant to certain diseases; treatment of seed or sugarcane sets before planting for protection against certain fungus diseases; destruction of harmful weeds etc., all tend to reduce the losses from different crop hazards. The extent to which they are practised however depends on the ability and the extent of education of the cultivator and even when they are availed of to the maximum extent the farmer's need for insurance protection will remain considerable. In fact an effective organisation for crop insurance will itself promote the use of such protective measures.

Inspite of the obvious need for crop insurance, the growth of crop insurance on a scale to afford adequate protection to the farmer is comparatively recent, although rural insurance on mutual principles is known to have been practised in very crude forms even before the advent of other types of modern scientific insurance. Until recently the only form of crop insurance available to the farmer was crop insurance against specific risks such as fire, hail, windstorm and frost and was offered by mutual societies, joint stock companies and also state departments. It is understood that in India some private companies cover tea plantations against specific weather hazards. However, among the forms of farm insurance against specific risks hailinsurance appears to have been the only one which has been placed on a satisfactory basis. It is clear however, that from the point of view of the needs of the farmer,

protection against specific hazards is obviously inadequate. Attempts therefore, have been made to evolve a form of blanket insurance that will protect the farmer against all hazards that are beyond his control. The earliest unsuccessful attempt in this direction in the U.S.A. is known to have been made in 1899, but the next one was made only in 1917. The subject of all risk crop insurance has remained a topic of national interest in the U S.A. during the last three decades and in the spring of 1923 a Senate Committee was appointed to investigate the entire subject. It was only in 1938 however that the U.S.A. Congress enacted the Federal Crop Insurance Act providing that Crop Insurance be offered on wheat with the 1939 crop year and that studies should be made which will provide a basis for expanding the programme to additional commodities. However, in spite of years of preliminary study and research the programme still continues to be visualised as in an experimental stage.

Inherent Difficulties of Crop Insurance.

4. The late growth of all-risk crop insurance, the many failures of the attempts to organise it as well as the prolonged experimentation on an extensive scale considered to be necessary all indicate the existence of difficulties and complications inherent in this form of insurance. A major difficulty lies in the absence of adequate statistics to throw light on the frequency and extent of the operation of the various hazards, partly because the experience of losses is of a widely varying nature and must necessarily be studied over a long period of good and bad seasons. Secondly, there exists a moral hazard and various forms of selectivity that appear in this type of insurance in various forms and only experimentation can show the way to guard against them. Further this makes a close supervision of the insured units a necessity; and where agriculture is carried on by many small-scale cultivators living at considerable distances from each other the cost of insurance must be prohibitive. On the other hand, the ability of the farmer to pay the premium is often limited and the opportunities for profit in this form of enterprise must be necessarily limited.

Complementary Character of Crop Insurance and Price Support Programmes.

5. Before proceeding to discuss the benefits that can accrue from a scheme of Crop Insurance, it may be pointed out that the insecurity in the life of the cultivator arises not only from variations in the crop yields but also from variation in prices. One of the lessons learnt as a result of the failures of the early attempts of Crop Insurance is that for successful operation of the scheme, insurance protection must be confined to variations in yield and not be extended to the variations in values. To derive the full benefit from a scheme of crop insurance however, it must be worked together with a programme of price support as in the U.S.A. It may be remembered however, that where the bulk of the produce is consumed by the producer himself, or used as payment in kind for goods and services, crop insurance may have substantial value even in the absence of a price support programme. Further, crop insurance on an adequate scale will itself prevent wide variations in the annual supplies to markets and tend to stabilise prices. For the same reason, it will make the operation of a price support programme easier. Moreover, effective crop planning such as may be necessary for working of a price support programme will be made possible as a result of a crop insurance scheme; at present owing to the operation of unpredictable and uncontrollable crop hazards control of acreages does not necessarily mean a guarantee of a minimum quantity of produce. The price support programme on the other hand will simplify the working of crop insurance to a considerable extent. It will enable premiums and coverages to be expressed in terms of cash and avoid the need of storage reserves, which form a major item of costs in a scheme of crop insurance on the U.S.A. model.

Benefits of Crop Insurance.

6. As pointed out above,a crop failure means not only a loss of income but also of investment to the farmer. The cultivator depends on the income from his crop from season to season, just as the wage earner depends on his wage from month to month. While Crop Insurance may be considered as the counterpart of

Unemployment Insurance available to the industrial workers in this sense, Crop Insurance clearly affords much larger protection. In fact in agriculture where production is carried on by the small-scale owner-cultivator there is no clear-cut distinction between capital which can and does bear the brunt of variations in production and labour which under normal conditions is assured a fixed income; and a severe crop failure not only means a loss of income in respect of work during a particular season but it also impairs the cultivator's ability to secure an income during following seasons.

In the event of failure of crops, the farmer who cannot count on a reserve of savings from his past earnings, has to resort to borrowing at exhorbitant rates or to private or public relief; but his ability to borrow must depend on the security he can offer and relief must be necessarily limited in extent and available in a few cases. Crop Insurance therefore may be considered as a partial Famine Insurance Scheme of a much more satisfactory kind than the present schemes of famine relief. In India relief of agricultural distress in extreme cases and to a very limited extent has been accepted as a responsibility of the state; but relief is confined to protecting people from starvation in times of distress. Advances to the agriculturists are made under acts like the Land Improvements Loans Act and Agriculturists Loans Act and suspensions and remissions of land revenue given. It is to be expected that in the new political context Government's responsibilities in this field will increase and it is suggested that a Crop Insurance scheme, aiming at helping the farmer to help himself through a largely self supporting scheme, and counting on the promotion of the habits of self help and thrift in the cultivator for its success, will be a much more satisfactory method of providing for the relief of distress from the point of view of the adequacy of the resulting relief and the cost to the state. The President's Committee on Crop Insurance in 1937, justified the Government subsidy to the Crop Insurance scheme in the U.S.A. on this score as follows:

"A crop insurance programme even for wheat only, should reduce to a considerable extent the necessity that has existed in the past for seed and feed loans, and similar relief. It should reduce the need for Federal programmes such as were carried out in the drought areas by the Federal Emergency Relief Administration and the Works Progress Administration. It should reduce and perhaps eliminate some of the temporary situations that required help from the Resettlement Administration Crop Insurance should help many wheat farmers to help themselves in such emergencies."

Crop insurance will help the farmer to maintain his credit in years following a crop failure so that he might borrow for production needs in subsequent years. It will also undoubtedly be of great value to institutions that extend agricultural credit, by enabling farmers to pay their debts with greater regularity, reducing overdues and the need to write off loans. It will also tend to stabilise land values by reducing fore-closures. It will remove one of the major causes of agricultural indebtedness in India and check the tendency for lands to pass out of the hands of the cultivator.

Crop Insurance will remove the possibility that the entire investment in the crop is lost owing to operation of various hazards. Further, it will improve the credit-worthiness of the farmer and make investment available to him. Crop Insurance therefore should promote intensive cultivation and result in improving crop yields. Moreover, one of the necessary conditions for successful working of the Crop Insurance organisation will be to encourage measures that will reduce risks and improve yields and ensure efficient agricultural practices and it will be in its interest to itself undertake measures of control of pests and diseases and encourage the cultivator to do so.

Crop Insurance brings security to the individual farmer and consequently to agriculture as an industry. It will also benefit the consumer and the people at large. As the President's Committee put it, " A reserve supply of wheat to meet years of crop failure is a public benefit that cannot be overlooked.

Furthermore, the consumer as well as the farmer would be benefitted by the more stable prices that such a system might bring about. In addition, more stable farm income is unquestionably of significance to the public at large". The President of the U.S.A. in his letter of 1936 which led to the appointment of the Crop Insurance Committee, enumerated contributions to the general welfare that would result from the twin programmes of Crop Insurance and Price Support, in the following words:

"First, protection and of the individual farmer's income against the hazards of crop failure or price callapse; second, protection of consumers against shortages of food supplies and against extremes of prices; and third, assistance to both business and employment through providing an even flow of farm supplies and the establishing of stability of farm buying power".

Demand for Crop Insurance in India.

7. Considerable thought has been given during recent years to the need of fundamental reform in the agricultural economy of this country and it is remarkable that persons looking at the problem from diverse angles have pointed out the need of schemes of agricultural insurance as an integral part of programmes of agricultural reform. Dr. Narayanaswamy Naidu in his report to the Government of Madras on the problem of rural indebtedness in that province submitted in 1946, recommended the establishment of schemes of Crop Insurance and Cattle Insurance in India on the basis of the Federal Crop Insurance in U.S.A. to guard against two of the major causes of agricultural indebtedness. The Cooperative Planning Committee recommended that experimental schemes of Crop and Cattle Insurance should be organised under State initiative and these recommendations were endorsed by the Conference of Registrars of Cooperative Societies in 1947. The Insurance Advisory Committee also made a definite recommendation for the early establishment of a scheme of Crop Insurance. Cattle Insurance has also received attention in the discussions at All India Food Conference and has figure prominently in the discussions of responsible bodies as a necessary agent for encouraging breeding of better types of animals and development of dairying in rural areas. The preparatory Asian Regional Conference held in New Delhi in 1947 recommended that

with a view to affording a larger measure of income security to cultivators Governments should consider the possibility of organising Crop and Cattle Insurance schemes, either for the country as a whole or for those parts in which it may be possible to take immediate action. Agricultural Insurance has also been the subject of frequent questions in the Central Legislature and in February, 1947, the Legislative Assembly adopted a resolution recommending that the Government should adopt an effective programme of Crop Insurance.

It will be noted that while considerable demand has been forthcoming from the leadership of the Indian cultivator and persons interested in planning for their welfare, the cultivator himself will have to be educated into appreciation of the benefits of such a scheme with the help of his leaders and other official and non-official agencies; but perhaps the working of a scheme on a limited scale, and demonstration of the benefits that it can confer in a year of distress will be one of the most effective methods of such education. It is clear therefore that under Indian conditions a scheme of Crop Insurance will need to have education of the cultivator as one of its objectives; and this implies that a start will have to be made with a limited degree of participation and an effort made to improve it. Conditions in this respect in the U.S.A. were of course different and the scheme there came into existence as result of a substantial demand for Crop Insurance from the farmers themselves.

Crop Insurance under a Subsistence Economy.

8. It may be appropriate at this stage to examine some of the doubts as regards the immediate feasibility of the scheme that have been expressed in different quarters.

9. It has been suggested that Crop Insurance has no place in a small-scale subsistence economy such as is prevelent in India at present. It may be worth while considering in some detail the precise implications of this stagement.

Firstly, it is clear that from the point of view of the cultivator, the need for crop insurance protection is all the greater in such an economy, since any reserves accumulated from past earnings to meet the impact of lean years must be necessarily limited. Further for a person living on the margin of subsistence habits of thrift do not come easily; sacrifice of a present satisfaction by laying

by a part of the meagre income to provide against future contingencies must necessarily be more difficult at such income levels. The proper method to meet the situation must of course be to increase the efforts to improve the income of the cultivator; but at the same time also to educate and encourage him into the habits of thrift and make thrift easier and more attractive. It will be easily seen that far from being inconsistent the two programmes are really complementary. From this point of view Crop Insurance may be considered as a method of promoting thrift and making it attractive; since when undertaken on a collective scale, certain benefits can be derived from thrift which are not available from separate individual attempts at thrift. Further, it is clear that the State should be the proper agency under such an economy who should take the initiative in organising schemes which will promote providence and self-help in the farmer. The ability of the farmer to withstand the impact of unfavourable years being limited, the extent of resulting agricultural distress must be more pronounced under such an economy and as pointed out above the state must necessarily undertake the responsibility of relieving it.

Secondly, the problem may be considered from the point of view of the ability of the farmer to pay the premiums. There must be a class of farmers who are chronically insolvent in the sense that they are at best able to make a living in good years but cannot save anything for bad years, so that during such years they have to fall back on either debts or public or private relief. But there is a natural limit to the debt that a cultivator can incur, since no more debts can be incurred after all his assets that can serve as security have passed out of his hands; and the extent of relief is of course very limited. It may be expected therefore that this class must be necessarily limited in extent. Beyond this class, the cultivator even in a subsistence economy must be finding ways and means of providing for his subsistence in years of distress. He may do so with the use of foresight and thrift in advance of the calamity; or by incurring debts when such calamity occurs which are paid for during subsequent years. Crop Insurance may be considered as a way of achieving the same object in a more efficient manner. It affords the cultivator an easily available machinery of saving. If the expenses of administration are undertaken by Government, he will get the full benefit of his savings and will be

completely relieved of the burden of interest. Moreover he obtains the advantages to be derived from collective saving. In case of an individual the calamity provided against may occur before his savings are adequate to meet it. Under a scheme of insurance, a calamity can be met whenever it occurs. Further, under such a scheme the farmer may buy security for a single year by paying the requisite premium; this will enable him to borrow for his production needs for the year or to ensure that what he has invested in his crop during the year will not be entirely lost. A crop insurance scheme can also be arranged so that to a certain extent there is a pooling of risks between high risk farms and low risk farms to the advantage of the former. It will be thus seen that essentially crop insurance affords to each farmer a method of spreading Calamitons losses occuring in a few years in the form of a fixed cost item each year; and there is no reason why this procedure should not be of value to the cultivator in a subsistence economy or be beyond his abilities.

Thirdly, a factor which has not been given adequate weight by those who concentrate on the cultivator's ability to pay the premium is the existence of elements of flexibility in the scheme. Various plans of insurance to suit the needs and abilities of various classes of cultivators can be evolved; there is certainly no need to insist that the cultivators should have either full protection or none. Further, there is no need to make the scheme compulsory in its operation, so that those who cannot pay need not join and others who can pay join as and when they appreciate the value of insurance. Moreover, even under a compulsory scheme, arrangements can be made to make participation voluntary in cases where the ability to pay the premium is doubtful. Lastly, for such classes, an adequate form of special subsidy to enable them to take advantage of insurance protection may be found out if considered desirable.

A further consideration that has been mentioned in this connection is that under Indian conditions certain moral hazards that operate in this form of insurance will be so exaggerated that the scheme will cease to be workable. Under a scheme of crop insurance such as is prevalent in the U.S.A., a short-fall in yield as compared with a guaranteed amount is indemnified if it arises out of causes beyond the control of

the insured. It has been pointed out that in a prosperous economy the cultivator will have less incentive to cause deliberate damage, for the loss may be greater than the compensation from insurance. But in a deficit economy such as ours, the danger is very real. This implies a misconception of the nature of the moral hazards involved. There is no unique figure for compensation under a contract and even in a deficit economy every farmer does produce a certain outturn in normal years. The level of compensation may easily be so related to the actual yield that the moral hazard can be made equivalent to that in the U.S.A., and in fact in another section of this note methods have been suggested to minimise it. An alternative plan has also been suggested in which the moral hazard will be very much less prominent.

It would appear that the real force of the argument may be summarised in the statement that Crop Insurance in a subsistence economy will be more difficult to work; but on the other hand, the effort to make it work will be worth the while. In a small scale economy, the unit of insurance will be very much smaller and the cost of administration comparatively larger. On the other hand, it must be remembered that in the revenue agency in India we have an organisation that can considerably help in the administration of the crop insurance, and which is used to perform similar operations in connection with the same small units. Further where the cultivator suffers from poverty and ignorance, thrift and self-help do not come easily: and considerable effort will be necessary to make the programme popular and to secure adequate participation in a voluntary scheme. Lastly, under these conditions short term considerations are likely to prevail over long term considerations and fraud and melfeasance will demand greater care and watchfulness.

Is a Scheme of Crop Insurance Premature under Indian Conditions?

10. A second consideration that is sometimes advanced is that while Crop Insurance may have its value it must necessarily rank low in a scale of priorities for programmes of agricultural reform. One of the reasons for this statement might be that less than a decade has elapsed since Crop Insurance has been made workable and it has therefore not figured prominently in the usual schedules of such programmes. However, the need to remove wide fluctuations in yields owing to various crop hazards as a major cause hampering the progress and productive efficiency

of the agricultural industry in India has been widely recognised; and for this purpose irrigation and other measures of crop protection have been recommended. As pointed out above a scheme of crop insurance will result in bringing stability to the agricultural industry and to this extent apart from its unfamiliar-ity there seems to be no reason why it should not be considered as of primary importance.

As against this, the view that Crop Insurance should be considered as an integral part of a programme of agricultural reform has always been emphasised in the U.S.A. This position has been admirably stated in the Report of the Manager of the Federal Crop Insurance Corporation for 1947 in the following words:

"Large sums of money are spent each year in agricultural research to develop better varieties of seed, more effective means of controlling insects and diseases and improved methods of farming. Soil conservation practices have been encouraged by making available technical assistance as well as cash payments to the farmer. Price supports have been provided for more than a decade to help to maintain some degree of stability in farm income. Despite all these measures the farmer will receive but little income in any year if he invests his time, money and effort to produce a crop only to be faced with a crop failure due to some cause over which he has no control. Insurance protection spans this crop-failure gap. It is an essential part of a well-rounded agricultural programme designed to provide security for the farmer."

This would appear to be the correct perspective in which to visualise a scheme of crop insurance. The manner in which it will help complementary programmes such as price support and programme for crop protection against diseases and pests and is in turn helped by them has been already indicated above. Control measures against pests and diseases, whether on a small or large scale are an essential part of any programme for increasing productivity and are at present organised by the staff of the Departments of Agriculture, either independently or with the cooperation of the cultivator, free of cost or at a nominal charge. It has been pointed out that the staff available for such tasks is necessarily limited and the field of that activity restricted; and a special staff for plant protection in every province was strongly recommended by the Famine Enquiry Commission. It is clear that such control must be

an essential feature of any programme for increasing productivity of land. In the Crop Insurance Organisation we shall have a body which shall be interested in this programme in its own interest, will enforce minimum precautions in this direction on each insured cultivator and may be interested in investing the necessary resources of men and money in undertaking control operations. How Crop Insurance could promote intensive farming, has also been indicated. The bearing of the problem on the programme of relieving the burden of indebtedness on the cultivator has been recognised; any scaling down of prior indebtedness must also be attended by a programme that will prevent its reaching the old levels and for this crop insurance together with a price support programme should prove effective. On the other hand, relief of prior debt will improve the cultivator's ability to pay the crop insurance premiums, and enable him to undertake the protective measures necessary for successful crop insurance. The salutary influence on the creditworthiness of the cultivator and on the institutions administering credit has been also pointed out. It will be seen therefore that a plan of agricultural reform must be visualised as consisting of many programmes which are complementary to each other, and crop insurance should be an essential component in such a programme.

There is a further consideration that will be relevant in this connection. There is not likely to be an inconsistency between scheme of insurance and any other scheme in the near future, in the sense of the former needing an investment of resources which will prevent other schemes being undertaken. Even in the ultimate stage of a scheme of crop insurance government's participation may be mainly to provide the costs of administration as in the U.S.A. But as pointed out later, the programme of Crop Insurance must necessarily begin with a pilot scheme limited in scale of operations; and as during this stage, at any rate, the work could belargely entrusted to existing agencies in the various provinces, the total cost of the scheme will be necessarily limited.

Agricultural Insurance and Secial Insurance for Industrial population.

11. One of the arguments sometimes advanced to indicate that agricultural insurance is premature in India is that even social insurance for industrial labour is yet to make a headway in India. This is perhaps based on a misconception that in all countries, irrespective of the nature of their respective economies, social insurance must necessarily precede agricultural insurance. This has not been the case even as a matter of history. This can be seen even if we confine attention only to those countries in which agricultural insurance has been managed by the state or actively aided by the state. For example in Bulgaria State Insurance against hail dates from 1896, while sickness, invalidity and old age insurance only came in 1924. In France sickness insurance applicable to all industrial classes came in 1928 and invalidity and old age insurance in 1910; however, the state aided national system of agricultural insurance dates back from legislation passed in 1900. In Germany sickness insurance came in 1883, invalidity and old age insurance in 1889 and pub-lic livestock insurance in 1896. It is hardly necessary to labour the point any further.

Anti-inflationary Policies and Crop Insurance.

12. It is clear that a system of collective saving against future calamities should have considerable attraction from an anti-inflationary point of view. It has been felt that under the present conditions it is not possible for political reasons to increase the land taxes. A comprehensive scheme of Crop Insurance might serve the purpose of immobilising a part of the surplus purchasing power in the hands of agricultural classes without provoking opposition.

Another consideration sometimes put forward in this connection relates to the possib-ility of substantial operating deficits during early years of the scheme. Such deficits, if they occur before reserves have accumulated, may have to be made good by annual appropriations or out of capital resources assigned to the Crop Insurance fund at the outset. It is necessary to remember in this connection that such operating deficits may arise in the course of the normal working of perfectly sound scheme, since in the basic calculations a balance between indemnities and premiums may be visualised only over a period of 10 to 15 years. A spell of bad seasons during the early years would therefore mean an operating deficit which would be made up by surpluses which may accure during later years. This in fact has been the experience in connection with insurance of wheat in the U.S.A. There was an operating deficit

during each of the first five years, but the trend was reversed in 1945 and by the end of 1947 crop year wheat - insurance operations for the eight years were expected to show premiums collected almost equal to indemnities paid. On the other hand cotton insurance has shown an operating deficit during each year since it was started in 1942; and the flax insurance experience for the two year period 1945-46 has been favourable, the losses amounting to only 72% of the premiums. The point that should be remembered therefore is that while operating deficits may arise even in course of the normal working of a good scheme, they need not necessarily arise, since this will depend on the character of the crop seasons during the early years of the operation of the scheme; and the sums spent in meeting them will be recovered during later years. Further it must be remembered that crop insurance indemnities during bad years will to a certain extent replace the government expenditure on relief and rehabilitation of the agriculturists during bad years. It is of course also possible that operating deficits might arise as a result of a defective actuarial basis of the scheme and operation of certain forms of selectivity and moral hazard. These of course must be guarded against so far as they can be foreseen and the extent of the operations of the scheme will be limited during the experimental stage with a view to securing the necessary experience on this point at minimum cost.

Nature of the Problem.

It may be worth while at this stage, by way of an introduction to the discussion of the different aspects of the scheme in the following chapters, to set forth clearly the various problems that must be faced in trying to evolve a scheme of Crop Insurance suitable to Indian conditions.

13. As pointed out above, while insurance of crops against specific hazards like fire, hail, windstorm and frost is known to have been one of the oldest forms of insurance, all-risk Crop Insurance which covers any and all hazards beyond a farmers control is of very recent origin. In view of the objectives of a programme of crop insurance in India, one must accept the view expressed in a recent bulletin of the Department of Agriculture of the U.S.A., that 'insurance which protects against certain hazards and leaves the insured exposed to total loss from other hazards beyond his control is not real crop insurance". But while it might be generally agreed that we should aim at a scheme of all-risk crop insurance in India, it must be remembered that even in the U.S.A.

where crop insurance has been experimented upon on an extensive scale since 1939, it has been accepted that 'the ultimate form of contract in all probability still remains to be devised'. The value of the experience obtained in the U.S.A. cannot be over-emphasised and certain principles which have been evolved there will have to be adopted in any attempt at formulating a scheme of crop insurance suitable for any other country. However, while the results of the unique experiment in the U.S.A. must receive careful study, it is clear that considerable attention will have to be given to the need for suitably modifying the principles and practices in the U.S.A. before they are transplanted on the Indian soil; in particular it must be remembered that even in the U.S.A. neither the form of contract nor the administrative techniques are considered as having been finalised.

By its very nature, crop insurance is intimately connected with the conditions of agricultural industry in a particular country and in fact the contract at present current in the U.S.A. takes into account the experience of each individual insured farm in determining appropriate premiums and insurance coverages. In this sense crop insurance is more complex than any other form of insurance. It is clear therefore that in devising a suitable form of contract and a suitable operational set-up for Indian conditions, the wide disparity between agricultural conditions in India and in the U.S.A. must be taken into account. The ignorance and poverty of the average cultivator in India, his conservatism, improvidence, shortsightedness and fatalism are factors that must be reckoned with. The small size of the cultivated holding and its fragmentation in India and the wide variety of agricultural practices must also be considered. In fact it has been argued that in a subsistence economy such as the one prevalent in India, a scheme of crop insurance is not feasible or at any rate that it is premature. As pointed out above this may be disputed, since crop insurance is only a more efficient and economical way of providing against calamities whose impact most cultivators are meeting today in one way or another; and moreover it has been recognised as essential for the success of many other programmes of agricultural reform. It must be admitted, however, that while the need of crop insurance in India is much greater than in the U.S.A. greater effort will be necessary to make it a success.

14. The foregoing remarks will indicate the nature of certain features of the problem of crop insurance in India that must receive attention before one sets out to devise a pilot scheme for use in India. It may be useful to specify these here, so as to provide a background for the

discussion in the following pages.

First, in view of Indian conditions a simpler and safer contract than the one in use in U.S.A. will have considerable attraction. In the U.S.A., the individual farm is still the essential unit of insurance, in the sense that indemnity is paid on the basis of the yield obtained on each individual farm. In view of the small size of the insured unit, ignorance of the cultivator and the varied agricultural practices this emphasis on the condition of individual farm will make the working of a programme difficult and expensive. This will indicate one direction in which simplicity may be introduced. A related problem is that of moral hazard, which is inherent in this form of insurance; this might result from the fact that in certain conditions the insured may find that it profits him to neglect production and secure the indemnity. Success of a scheme of crop insurance must depend on the extent to which the operation of such moral hazard is controlled. One way of doing this would be by evolving a suitably modified form of contract.

Secondly, it has been pointed out that in view of the ignorance, conservatism and poverty of the Indian cultivator a compulsory scheme would alone have a chance of successful operation in India. On the other hand, there are also those who strongly believe that during the experimental stage at least the scheme must necessarily be on a voluntary basis. The scheme in the U.S.A. is entirely voluntary. In India a compulsory scheme of all-risk crop insurance has been in operation in the Dewas Junior State since 1943, but the benefits permitted under it are very modest. The system of remissions and suspensions of the land revenue demand current in India might itself be considered as a compulsory scheme of crop insurance, but of course the maximum benefit therein is only equal to the revenue demand. The problem is essentially whether it will be possible to secure a substantial degree of participation in the scheme without compulsion in some form and therefore is essentially a practical one. Since those competent to judge differ so strongly, it is clear that this problem must receive careful consideration.

In this connection it may be pointed out that, while thinking of the practicability of crop insurance in India, the extensive land revenue machinery in India must be considered as a great asset. It is difficult to imagine a project of vast dimensions such as a comprehensive scheme of crop insurance operating successfully without utilising the

knowledge and experience of the revenue field agency; and since as pointed out above the revenue agency is in fact itself running a compulsory scheme of crop insurance, it should be possible to integrate this agency into the operating set-up necessary for crop insurance. This will have an obvious bearing on the cost of operation of the scheme, which in view of the small insured unit in India will be a major consideration.

Thirdly, the paucity and inadequacy of agricultural statistics in India must prove a major hurdle in the way of evolving a scheme of crop insurance. It must be remembered that for purposes of crop insurance it is necessary to have comparable statistics of yields relating to a prolonged period of years and to each crop and each representative area. Collection of new statistics must therefore be a long-term programme, and for making a start it is therefore necessary to depend on such statistics as are available, and to evolve techniques to wring out the greatest quantum of information from them. The methods current in the U.S.A. may therefore have to be modified with a view to improving them if possible, and also with a view to making them suit theless adequate statistics in India. It is also clear that an attempt must be made in course of the working of the pilot scheme to provide a more satisfactory statistical basis. For this purpose, it will be desirable to frame the machinery to be utilised for the operation of the scheme in such a manner that it might incidentally supply the necessary information for strengthening the statistical basis of the scheme, and in addition supplementary information which may not be of immediate applicability for the working of the scheme may also have to be collected. In fact, this is one of the considerations that will have to be borne in mind injudging the cost of a pilot scheme in relation to the number of insurance contracts in force at the outset. It might turn out that a portion of the working cost might remain practically the same whatever the degree of participation in a particular area. The value of the benefits the pilot scheme brings must be judged not only in terms of the potential participation in the particular area, but in termsof the value of the experience thereby secured as basis for a more comprehensive scheme.

A fourth problem that might receive attention is the relative efficiency and suitability of various types of administrative agencies. The U.S.A. scheme is entirely managed by the State through a Corporation. A second alternative would be small local societies working on

the principles of mutuality and cooperation with or without state-aid; this form of insurance has been found suitable for working crop insurance against specific risks in many foreign countries. It is understood that an all-risk crop insurance scheme is in operation in Japan which is administered by agricultural cooperative associations belonging to various communes into which peasants and silkworm breeders are grouped; these work on mutual principles and government reinsures 70% of the risk undertaken by them. A third alternative is the possibility of private insurance companies undertaking agricultural insurance. In this connection it may be useful to consider the pilot scheme stage separately from the later more comprehensive stage of the scheme.

A further problem would be the extent and form of the state subsidy to the scheme. The scheme in the U.S.A. is largely self-supporting, the government subsidy being limited to the payment of expenses of administration. It appears clear that in the event of a state managed scheme in India Government will have to subsidise it at least to this extent. Whether Government should, at least during the experimental stage, subsidise the scheme to a larger extent will be a problem that must also be considered. In this connection the size of premium necessary may be a relevant consideration. In connection with this problem it must be remembered that as a result of the operation of a comprehensive scheme of crop insurance, certain direct improvements will result in the revenue position of the Government. First, the need for remissions and suspensions of revenue owing to seasonal conditions will not arise. Secondly, there will be considerable saving in the sums spent on relief of agricultural distress in times of famine.

15. It is clear that the nature of the details of a pilot scheme will depend on the decisions arrived at on the problems briefly stated in foregoing paragraphs. In formulating such a scheme the following questions will need to be answered.

It may be presumed that insurance will be confined to a few major crops and the scheme extended from one crop to another as in the U.S.A. Selection of the crops to be insured will therefore be the first step.

Secondly, since it is agreed that a preliminary experimental stage for an insurance of this type is necessary, and therefore it is proposed to confine insurance to certain areas, selection of appropriate areas in respect of each crop and their extent will have to be the next step.

Further, assuming that a voluntary scheme of insurance is considered desirable, it will be necessary to consider whether a certain minimum degree of participation should be prescribed before insurance is provided in any selected centre.

Lastly, when decision as to appropriate agency for working the scheme and the type of contract are arrived at, it will be necessary to suggest a suitable machinery for operating the scheme. In this connection it may be remembered that the scheme current in the U.S.A. visualises the setting up of storage commodity reserves, by which the excess of the premium income over indemnities in good years is made available for payment of the excess of indemnities over premiums during bad years. One of the problems to be considered is whether to insist on the full machinery of commodity reserves during the experimental stage inspite of the limited scale of operations visualised.

I have attempted in the following pages to discuss the various problems outlined above and to suggest lines on which they might be solved. I have also appended a note in which the various details of the scheme are worked out with a view to presenting a concrete picture in respect of one province.

Chapter II

Approach to Problems of Crop Insurance Under Indian Conditions.

1. In the following discussion it is assumed that a scheme of all-risk Crop Insurance on the lines of the scheme at present in operation in the U.S.A., with suitable modifications, will be found acceptable in India. A fairly comprehensive account of the various aspects of the U.S.A. scheme is given in the appendix. Certain salient features of the U.S.A. scheme may, however, be briefly mentioned here.

Under the scheme in the U.S.A. the main type of contract takes the form of a guarantee of a percentage of the average yield of the insured farm and any shortfall in any season caused by any factor beyond the control of the insured is made good under the contract. Contracts with optional coverages are allowed, the maximum coverage being 75% of the average yield. The contract thus guarantees yield and not its value and both premiums and coverages are expressed in terms of the commodity, although for convenience payments may be made in terms of current cash equivalents. The excess of the premiums over indemnities in fat years are intended to be carried as storage reserves to meet the excess of indemnities over premiums during lean years. The scheme is purely voluntary and is mainly self-supporting, the Government subsidy being confined to the payment of expenses of administration. It is managed by the U.S. Department of Agriculture through the Federal Crop Insurance Corporation.

Befour suggesting certain modifications which it is believed will add to the workability of the scheme under in Indian conditions it may be worth while defining certain general lines of approach followed in the U.S.A. which may be adopted in India.

Storage Commodity Reserves.

2. In order to eliminate the need to predict prices, premiums and coverages should be expressed in terms of the commodity and the reserves carried in the form of commodity. The only other way to eliminate prediction of prices is to have premiums and reserves on the basis of an assumed arbitrary price; but there would appear to be serious dangers in this procedure. E.g., in the event of a serious fall in prices as compared

with the assumed price the premiums may be very heavy in terms of the income of the farmer and the sum assured too large so as to make the indemnity much more attractive than an adequate crop yield. On the other hand, if an exceedingly low price is assumed, the value of insurance protection and the attraction of insurance will be seriously impaired. For convenience, however, premiums and indemnities may be expressed in terms of cash at appropriate current prices, and if the scale of operations is so small that storage reserves do not appear desirable the state may avoid setting up such reserves, by bearing the burden of adverse price fluctuations.

3. It may be remembered that under present conditions in India the problem of storage reserves will be simplified since the storage arrangements made in respect of procurement under rationing schemes may be utilised in connection with Crop Insurance. It may also be noted that licensed warehouses are being established in certain provinces in India and these too could be integrated into the working of the scheme of Crop Insurance.

Extension of the Scheme from one Commodity to Another.

4. A second principle that may be accepted is that of extending insurance from one crop to another. It could be said that just as all-risk crop insurance is more satisfactory than insurance against specific risks, from the point of view of the needs of the farmer, insurance protection covering all the crops sown by him should prove of more value to him than protection in respect of only a part of his crops. However, problems of storage reserves will be easier to tackle commodity-wise. Secondly, study of the nature of various physical hazards involved, nature of moral hazards and adequate measures to restrict them is easier if made crop-wise. This is explained in the appendix A by comparing wheat insurance with cotton insurance. An extreme example that has been pointed out is in connection with the problems of insuring fruit. Control of insects and disease, variation in production with the age of trees, extreme variations in risks due to topography and location of orchard, all present new probelms; further with such an extremely perishable commodity the idea of reserves in kind becomes in-applicable. Thirdly, statistics in respect

of minor crops are non-existent. Further a position where most of the major crops cultivated are covered will be approached in due course as the crop insurance scheme is extended. In case the idea is to insure income from crops, this will need the prediction of a complex of prices.

Need for an Approach through an Experimental Pilot Scheme.

6. As pointed out earlier, the need for an approach on an experimental basis, limited in operation to a few crops and to a few areas arises essentially from the complex nature of this form of insurance and secondly from the fact that even in the U.S.A. this form of insurance is still in its experimental stage. No amount of preliminary research and study can provide essential information on certain features of the scheme and experimentation on adequate scale can alone suffice for the purpose.

Secondly, experimentation on a limited scale will enable such experience to be bought at a minimum cost; and this is a consideration of particular importance in India for two reasons. Here moral hazard may be more prominent than in the U.S.A. and further a start may have to be made on a statistical basis that is not entirely satisfactory. In fact, one of the objectives of the experimental scheme will be to organise collection of satisfactory data.

Thirdly, while in the U.S.A. crop insurance was evolved to meet an existing demand for protection, one of the functions of the scheme in India will be to create such a demand by adequate publicity and by a practical demonstration of the value of insurance by actual working. Another feature of the educative aspect of the scheme will be the training of a body of persons in the different areas in the problems of crop insurance.

Analysis of the nature of Crop Insurance Contract.

6. It is clear that for operation in Indian conditions it would be desirable to modify the form of the contract in the U.S.A. This may be desirable even at the cost of reducing the value of insurance from the point of view of the insured to a certain extent, if necessary, with a view to achieving firstly, a simplicity in the form of the contract and its working; secondly, reduction of the moral hazard involved and thirdly, lowering of the cost of insurance.

To visualise the precise nature of the various elements entering into the Crop Insurance contract, the following description of a slightly more general form of contract may prove useful:

Suppose under a plan of insurance, a maximum indemnity is payable if there is a total crop failure; but that only a fraction of this indemnity, proportional to the defect by which an actual 'condition factor' (indicative of the condition of the crop in the particular season as compared with the 'normal' crop) falls short of a particular level such as 75%, is payable in case of a partial failture. For example, in case of a crop failure indicated by a condition factor of 25% the amount of indemnity will be (75 - 25) S/75 = $\frac{2}{3}$ S.

Two practical questions arise at once: (1) First, how to define the condition factor? E. g., it could be defined in terms of any measurable quantity correlated with the condition of the crop, such as rainfall. But assuming that it is to be defined in terms of the crop yields per acre during the season, the question would arise as to what unit area such condition factor should refer; should it be the insured farm, or the village, taluka or district in which the farm is situated? Secondly, must there be a limit on the maximum indemnity S that could be guaranteed, apart from the ability of the insurer to pay the corresponding premium?

It is clear that from the point of view of the needs of the insured, the natural unit in terms of which to express the condition of the crop is the insured farm itself. It may be pointed out, however, that the use of the condition factor appropriate to larger units may yet be fair in the sense that the total premiums paid by the farmer over a representative period of years will be equivalent to the benefits received by him (apart from any loading for costs and any pooling of risks between different classes that may be visualised in the plan). This is true, whatever the degree of correlation between the condition factor actually used and the condition of his own farm. However, the value of insurance as protection against crop failure will depend on the degree of such correlation. Nevertheless, there is no necessarily unique measure of the needs of farmer, and if the unit selected is not too large and not too heterogenous there may yet remain a considerable conformity between the availability and the size of the indemnity and

the needs of the farmer, since in a given area crop failures of an extent sufficient to need indemnification will generally be widespread. It is clear that the value of insurance from this point of view will decrease as the unit for which the condition factor is assessed becomes larger and larger; but nevertheless the farmer will get an adequate return for his money even then.

In the plans current in the U.S.A., the condition factor of the insured farm is taken as the basis of insurance. While this ensures the maximum conformity between the indemnity and the need of the farmer, there are certain difficulties that arise as a consequence. These are of three kinds:-

(i) The main difficulty in this form of insurance is the substantial mormal hazard involved. E.g., in the U.S.A. scheme, 75% of the average yield of the farm is assured and any deficiency in a particular year made good under the contract. Thus as soon as the expected yield in a given year comes to be near the insured amount, the insured ceases to have an incentive to produce the maximum crop, since any shortfall will in any case be made good under the contract and additional effort does not necessarily increase the total income. It is clear that if the condition factor of a wider unit is used, the indemnity will not depend directly on the condition of the insured farm and the product of additional effort will add to the income of the farmer. Under an individual farm basis plan under certain conditions it is possible therefore that it may profit the farmer to lower the condition of the crop by neglect or deliberate malfeasance; or at any rate such lowering may not involve him in a loss and on the other hand may save him labour and other costs. Thus methods and machinery have to be devised to control such moral hazard.

(ii) Secondly, under this plan an indemnity is payable only in respect of causes other than neglect or malfeasance. This necessitates a definition of what constitutes negligence, and in view of the very variable agricultural practices in India this will be a matter of some difficulty. Considerable attention to the insured farm becomes necessary and loss assessment becomes an intricate and difficult operation and has to be done separately for every farm that has incurred a loss. Precise assessment of the condition of each farm is difficult in Indian conditions

where the unit is small and may give rise to considerable scope for fraud.

(iii) Thirdly, for an adequate actuarial basis for thistype of insurance a reliable record of yields of a representative sample of individual farms in each area with similar conditions as regards productivity becomes necessary. In Indian conditions such data are not available; approximations will be necessary to make a beginning and more adequate data will have to be collected in course of the operation of the scheme.

However, in spite of all its intricacies, the U.S.A. plan of taking the condition of the insured farm as the basic factor has considerable attractions. It may be suggested that the moral hazard involved in it could be considerably minimised and the impairment of the incentive to produce prevented, if the maximum sum assured under the contract is limited to a lower figure than is permitted in the U.S.A. This may be illustrated with the help of a numerical example.

Assume that the insured farm has an average yield of 400 lbs. per acre. Under the U.S.A. contract with 75% level of coverage, 75% of this average,i.e., 300 lbs. per acre, is the maximum sum assured and an indemnity proportionate to the defect is paid if the condition factor of the insured farm falls below 75%. Under this contract a deliberate lowering of yield by 1% will result in a loss of yield per acre of $\frac{400}{100} = 4$ lbs.;on the other hand the increase in the indemnity secured thereby will be $\frac{300}{75} = 4$ lbs. The plan, therefore, is so adjusted that no profit is obtainable by deliberate lowering of yield. But it must be remembered that no loss is involved either, in case the condition factor is below 75%. Also, certain savings in costs of production may be possible as a result of such lowering of the condition. To guard against any neglect or malfeasance occuring as a result of this, measures are provided in the U.S.A. Scheme. Provision for early intimation of apprehended crop losses followed by inspection; minimum standards for operations to be carried out in connection with crops of sub-normal expectations; partial payment of the sum assured in case of crop losses before harvest to allow for saving in costs; and generally stringent crop loss adjustment are all measures designed for this purpose.

A further risk in this type of contract which is of considerable importance in view of the limitations of available data in Indian conditions, arises in the event of overestimation of the average yield and

consequently of the insurance coverage. To illustrate this, assume that the true average yield of 400 lbs. is overestimated as 500 lbs. In this case an indemnity will be payable as soon as the sum assured falls below 375 lbs., i.e. 94% of the true average yield, and since such small eviations from the average occur with much larger frequency than larger deviations, a large increase in the cost of insurance to the insurer will result. Further, the level at which the incentive to effort becomes weakened will now be reached oftener and dangers of consequent loss in production and loss to the insurer from moral hazard are increased.

Suggested modifications in the contract.

7. It is suggested that under Indian conditions, a contract based on the condition of the insured farm, will be greatly imoroved if the maximum indemnity payable is lowered. Thus under a contract when an indemnity becomes payable on the condition factor falling below 75%, the maximum indemnity payable may be limited to 50% of the sum assured; or, in case of a contract where an indemnity becomes payable on the condition-factor falling below 50%, a maximum indemnity of 33⅓% of the sum assured may be permitted. In each case contracts guaranting lower sums assured at proportionately lower premiums may be allowed. The advantages of this may be stated as follows:-

(1) The moral hazard will now be considerably reduced; e.g., in the above example, while as before a deliberate lowering of the yield by 1% results in a loss of 4 lbs, the consequent increase in the indemnity is now only $\frac{200}{75} = 2\frac{2}{3}$ lbs. A substantial loss to the cultivator will therefore result and this will minimise the moral hazard; therefore, the efforts at control of moral hazard will be rendered easier and more effective.

(2) The dangers resulting from overestimation of yields as a result of inadequate statistics will be less serious. Thus in the above example, the sum assured, in the event of an 400 lbs. yield being overestimated as 500 lbs. will be 250 lbs. which is only 62½% of the true average yield.

(3) The premium under the contract will be correspondingly lower which may add to the attractions of the scheme in India.

As indicated above there is another direction in which the contract may be modified so as to add to its simplicity and workability.

The contract may be based on the condition factor of an area in which the farm is situated. It is clear that with a view to making the indemnity conform to the needs of the individual farm an attempt should be made to make the area as homogenous as may be practicable. This may be borne in mind in selecting areas for the operation of the pilot scheme. It may be noted further that the particular crop may itself be planted on soils within a particular range of quality and when insurance is confined to a particular crop this will result in an automatic selection of comparatively uniform grades of soil. In addition to this, it will be further desirable, at any rate in course of time, to divide the soils into a few grades according to productivity and production risks for this purpose. It may be suggested that the soil classification used for land revenue purposes may offer a preliminary basis for such grading.

Under such a plan, if the long term area annawari is 12 annas; an indemnity will be payable under a 75% coverage plan whenever the area annawari falls below 9 annas in a particular year; if the actual area annawari turns out to be 7 annas every insured cultivator in the area will get an indemnity equal to (9-7)/12x100 = 16.3% of the maximum sum assured under the contract.

As pointed out above a contract based on this principle compares unfavourably with a contract on an individual farm basis, from the point of view of the needs of the farmer. An individual farm may sometimes have a loss when the area average is normal and therefore will not be protected in that event; on the other hand some of the low risk farms may not have a loss even when the average condition of the area falls below the prescribed level. Further, there may be difference in the size of the loss actually incurred by the farmer and the size indicated by the variation in the area condition factor. Nevertheless, provided that the average experience of the tract in respect of a representative past period on which the premiums are based is reliable, it may be expected that each farmer will cover a period of years receive by way of indemnities the equivalent of the premiums paid by him or on his behalf.

8. Evidence that a contract based on the condition of a tract will conform substantially with the needs of the farmer will be found in the experience of the machinery for suspensions and remissions of the land revenue demand during unfavourable seasons. The provisions in this connection will also suggest ways by which the main benefits may be

supplemented in cases of individual hardship. In fact the system of remission of land revenue may itself be considered as a scheme of crop insurance with benefits on a modest scale. In connection with such remissions and suspensions different procedures are followed in case of (1) widespread calamities due to general crop failture, and (2) local calamities occasioned by hail, flood, locusts and the like. When local enquiries indicate partial or total crop failure or destruction of crops throughout any tract on account of drought or any other cause, suspensions are granted on a prescribed scale without detailed enquiries into circumstances of individual holdings. On the other hand in case of local calamities, suspensions are granted after an investigation of individual cases. It may be suggested, therefore, that in the proposed scheme while the main benefit may be made to depend on the average condition of each tract, this may be supplemented so as to take into account specified local calamities. Data to serve as a basis for estimating the extent of incidence of local calamities and their relative importance will be available in tehsil records in appropriate village forms. But it may be pointed out that where the statistical basis for insurance depends on the history of yields of individual farms no special allowance for supplementary benefits may be found necessary. It will be clear that the provision of supplementary benefit will ensure practical conformity between the indemnity and the needs of the insured, without detracting from the simplicity of the scheme.

In this connection, and especially in view of the benefit on account of 'local calamities' the desirability of a provision for declaring certain kinds of land uninsurable might be considered. A provision on these lines is included in the U.S.A. scheme and its nature will be clear from the following extract from the Country Procedure Manual for 1948 Wheat Insurance:

> " All land in the country should be carefully reviewed by the county committee to determine the farms, part of the farms or areas where it appears the Corporation should limit or refuse to accept insurance because of the risk involved. Where it is determined that the risk of growing wheat in any area is so great that it precludes the establishment of a sound crop insurance programme, such area shall be declared noninsurable. Some of the factors which would

affect this non-insurable determination are severe wind, erosion, flood, soil deficiencies, destruction by game or wild life, etc."

Also in demarcating areas in which to permit uniform coverages and premiums it is laid down that "the county committee shall review all factors which should be considered in the risk of growing wheat. It is important that careful consideration be given to loss experience under previous Crop Insurance programmes, the location of recognised hail areas, presence of unusually light soils subject to erosion, flood and any other conditions which should materially affect the risk of growing wheat, and making premium rate determination". This would indicate the need for insuring such areas with appropriate extra premiums. This problem may also need study in the various areas.

9. The actual machinery utilised for working the provisions for land revenue suspensions and remission will repay careful study. The relevant rules and commentaries relating to the Bombay Presidency are given in Appendix B.

It will be noticed that the estimation of the crop condition takes place in the first instance in relation to each village and an elaborate machinery for estimating the condition for each season is prescribed. Second, in arriving at the village annawari not only the conditions of the major crops in the village but of all the crops are considered. And lastly, an allowance is made for the avenage classification of the land on which each crop is sown. As against this it will be noticed that since only a major crop in the area is sought to be covered for crop insurance purposes the problem is really much simpler and the need for allowance for variation in quality of land is much less serious.

10. Nevertheless, it will be useful to consider at some length the precise manner in which the soil classification used for land revenue purposes could be utilised for the purpose in view. This classification is intended to be based primarily on the productive qualities of the soil, and takes into account various factors like the following: texture and depth, position (e.g., undulating, sharply sloping, damaged by scour, irrigated, embanked, double cropped, low lying and improved by silt, etc.) and zones (e.g. manured by village drainage, near to village site, damaged

by wild animals). The relative productivity is expressed by terms of soil factor or soil annawari attached to each soil. These determinations may be done in terms of large areas considered comparatively homogenous such as a tahsil. A fairly reliable check on the relative productivity of the various soil classes may be obtained by utilising the results of crop cutting surveys on a random sampling basis which are now being carried out in the various provinces in India. The results of an investigation on these lines carried out by Dr. V.G. Panse are given in an appendix to a later chapter. It is suggested that similar investigations may be conducted in relation to the other tracts where it is intended to operate the scheme.

In the U.S.A. variation of farming practices in a given area is taken into account, e.g., for wheat some of the practices considered were: summer fallow, irrigation, fertiliser, wheat grown immediately following an irrigated crop, etc.

Considering next, the precise manner in which the soil classification can be utilised it may be remembered that there are two elements which enter into a contract of crop insurance. First, the long term average yield, and second, the seasonal variability of yields as measured by an index like the coefficient of variability. In view of the main basis of the classification the average yields would naturally be expected to vary with the soil class. Allowance for this may be made by assigning different average yields and, therefore, maximum insurance coverages to different types of soil. The next question will be to see if the seasonal variability will also vary with the soil class. Some evidence to this effect may be found in the experience in the U.S.A. where the premium for low yielding farms was found to represent a proportionately higher percentage of the average yield. Some data from the agricultural farms so far investigated does not however indicate any definite negative correlation between average yield and the coefficient of variability. It may be remembered further that if the seasonal variability or the condition factors is not considered as varying from one class of land to another, the premiums would represent the same proportion of the sum assured in each case; and the better soil classes will get no definite benefit apart from a higher maximum sum assured. If it is desired to make allowance for the U.S.A. experience a rough basis might be to allow the same

actual premium, in respect of the maximum coverage for each class of land. Thus if for certain classes of land in a centre the yields of cotton for three soil grades are respectively 250 lbs, 200 lbs and 150 lbs, while the average for the centre is 200 lbs., a uniform premium of 4% of the centre average yield for the centre would represent respectively 3.2%, 4% and 5 1/3% of the actual average yields in case of the three soil grades.

A provision of this form will have the advantage of enabling the Insurance Corporation to encourage practices leading to higher yields, such as use of better varieties, manures etc.

Another problem that will have to be considered in this connection is whether to proceed on the assumption of different seasonal variability for different soil grades, in actual operation of the scheme. This will necessitate the determination of a separate condition factor in respect of each class of soil at least during the seasons when a crop loss is apprehended. It may be suggested however that during the early years of the scheme at any rate a single condition factor may be aimed at. In course of the investigation carried out for this purpose it will be possible to secure material to decide whether different coefficients of variability may be assumed in different soil classes.

11. This modified form of contract, if adopted, will obviously introduce elements of simplification and safety in the working of the scheme. These may be enumerated as follows:

(1) The scheme will eliminate moral hazard to a considerable extent since both the condition for the payment of the indemnity and its extent depend on the average condition of the area and therefore are not directly influenced by the insured.

(2) Further any additional effort in producing the crop will result in additional income and therefore the incentive to put forth maximum effort will not be weakened.

(3) Overestimation of the yield of the farm or the maximum sum payable under insurance will not add to the moral hazard and costs to the insurer, since the conditions under which the indemnity becomes payable is not directly under the control of the insured. However, it will be desirable to limit the maximum indemnity payable to provide against over-insurance.

(4) The problems of crop loss adjustment will be simplified.

The need for defining negligence will not arise. The existing land revenue machinery for fixing the annawari could be directly utilised for crop-loss adjustment.

(5) The existing statistics will be comparatively more satisfactory for laying down a basis for such a scheme and the problem of collecting statistics for future use will be simplified.

PROCEDURE FOR CROP LOSS ADJUSTMENT.

12. The importance of the loss-adjustment phase of crop insurance operation for the success of the scheme has been emphasised. In the U.S.A., provision for early intimation of apprehended losses and subsequent inspection of the insured unit is made. It will be remembered that in normal years only a few farms in a given area will be involved. In addition, elaborate procedures are prescribed. For example in connection with wheat and flax, the instructions are that "the reasonableness of the quantity treated as related to the acreage harvested should be considered, and a comparision of the yields of other comparable farms in the village should be made. The stubble and any other available evidence of the quantity of production shall be examined. Other enquiry and search should be made if the yield appears to be inconsistent with the yield of comparable farms in the area. In order to be sure that all production is accounted for, the adjustor must examine all storage receipts, sales records, grain on hand and records of any quantities of the insured crop produced on the insurance unit which has been used for seed or feed". It is clear that in India in view of the small size of the insured unit, its fragmentation and the ignorance of the insured the problem of loss adjustment must involve much greater difficulty and cost. However, these difficulties need not be overstressed. In particular, it may be remembered that considerable precision can be attained in eye-estimation of yields by persons with experience and these estimates will be available for checking the yields.

However, in case of a type of insurance based on the condition factor of a tract the probelm of assessing losses becomes considerably simplified. For this purpose, it may be possible to lay down a procedure based on careful eye estimation of a certain number of randomly selected fields in each village, so as to correspond with the current practices of annawari estimates by land revenue agencies. However, the much more

precise and objective procedure of crop cutting surveys on a random sampling basis will be very desirable. In particular the complete objectivity of the procedure will serve to eliminate any suspicion of a deliberate bias or manipulation against the interests of the insured.

It may be remembered that suspicion of such bias on the part of land revenue agencies has not been infrequent. It will be very desirable in this sense if non-official persons in whom the local people could trust were associated with the work of loss adjustment in some way. Crop cutting surveys are now being carried out in connection with most major crops in the provinces. The extent of the sampling undertaken is however adjusted to produce estimates of yields per acre for the whole province with a sampling error of 1 or 2%. In connection with crop insurance it would be necessary to produce estimates of specified degree of precision in respect of each homogenous tract in which it is proposed to operate the pilot scheme. It may be suggested that it may suffice to base the scheme on the nearest annawari estimate of crop condition, and where 12 or 13 annas is the normal crop a sampling error of 2% to 3% will be practically adequate. It may further be noted that in seasons which are obviously favourable so that no indemnity could be payable, it may not be necessary to have any estimates of condition, or at any rate estimates of much lower precision would suffice; or, it may be possible to rely on eye estimation only. During the pilot scheme stage,however, it would be advisable to have estimates of the same precision every year. The ancillary information that can easily be obtained in course of such surveys will be of great value for refining the machinery for crop insurance; the soil class in relation to yield has already mentioned above; but also the effects on yields of various agricultural practices, irrigation, varieties, type and quantity of seed, manures, etc. for which allowance could be made in the crop insurance contract could be studied. Possibilities of the precision attainable by eye-estimation,directly or when supplemented by crop cutting experiments on a smaller scale,could be studied at the same time. It may be remembered also that on the basis of preliminary reports it may be found necessary sometimes to divide a given tract into sub-regions for purposes of crop assessment. Eye estimation may also have to be relied on for checking the yields in case of local calamities, as at present.

It should be found possible in course of time to replace the present revenue machinery for estimation of crop condition by the crop

experimentation suggested above. It may also be possible to collect in course of such surveys reliable information that would be useful in connection with revisions of revenue settlement.

It may be useful at this stage to point out certain considerations about the cost of such surveys in relation to the total participation in the crop insurance scheme in a given area. First, as pointed out above intensive surveys will be necessary only in case of years of unfavourable crop conditions. It is proposed to undertake a full survey during the pilot scheme stage merely with a view to supplying an adequate statistical basis for the scheme. Second, this work could in course of time form the normal routine of the revenue agency, replacing what they are doing at present. In fact, when a comprehensive scheme of Crop Insurance comes into force, the need of land revenue remissions and suspensions will be obviated and the revenue agency will be freed of certain duties. Third, it should be remembered that the cost would be independent of the actual degree of participation in a given tract, and would remain the same, if for example, a compulsory scheme of insurance were in force. Even in the case of a voluntary scheme the cost should therefore be judged in terms of ultimate degree of participation that can be visualised as possible in a given tract. Fourth, as a result of the surveys during the pilot scheme stage methods might be evolved for reducing the extent of sampling, for example, by combining eye estimation with estimation by crop cutting experiments.

The problem of assessing the condition of individual farms in the event of 'local calamities' will be comparatively much simpler; for one thing only a small number of farms will be involved and also the nature of the risk may be such that the extent of the loss may be determined more easily.

SOME MISCELLANEOUS PROBLEMS.

(a) Effect of Insurance on Land Revenue Suspensions and Remissions.

13. It has been pointed out that the need for remissions and suspensions of land revenue during years of partial or total crop failure need not arise in case of farms protected by an insurance policy. Where a scheme operates on a compulsory basis, such relaxations of land revenue demand may therefore be withheld and consequent increase in the government revenue may be considered as a justification for the state subsidy to the scheme. Even when the scheme is on a purely voluntary basis it may be argued that since the insured are receiving the benefit of the government subsidy to the Crop Insurance scheme, it would be equitable to deprive them of the benefits of such suspensions or remissions. However, it is suggested that in case of a voluntary scheme, at any rate until the scheme develops and secures the participation of a substantial number of cultivators, it would not be advisable to withhold from the insured the benefits to which he would be entitled if he had not participated in the scheme.

(b) Who should be insured? The question as to whom a policy should be issued in respect of a cultivated holding is of considerable importance especially when insurance is on the basis of the condition of the individual farm. When the cultivator is himself the owner no difficulty arises. However, when the cultivator is only a tenant the risk involved in issuing policies in respect of full value of the crop to both the owner and the tenant can be easily realised. It is clear that in that case a policy should be issued to the person or persons who bear the impact of crop failture and in respect of the extent to which they bear the impact. Thus if a cultivator pays a fixed rent, which does not vary with actual crop condition, he may be given a policy in respect of full value of the crop. If, however, the owner and the tenant share the produce on an assigned basis, each should be covered to the extent of his interest in the crop. It is clear that in case of a policy based on the condition of a tract these considerations have not the same forece, apart from the extent of the protection against local calamities. It may be suggested however, that even in the case of such policies, the same policy may be followed. It may also be pointed out that even where the owner receives

a fixed rent, he will benefit from the insurance protection which the tenant buys in the sense that the regularity of payment of the rent will thereby be assured and the need for writing off arrears as irrecoverable or resorting to other procedures to recover them would be obviated. It will be in his interest therefore to encourage insurance directly or indirectly by reducing the rent.

(c) When may the premium be paid? It is clear that it would be possible to secure a much larger participation in the scheme if it were possible to take out an insurance policy before seeding and to pay for it out of the insured crop when it is harvested. This consideration obviously applies with particular force in India in view of the economic condition of the cultivator. The principal difficulty is such plan would be the difficulty in certain cases of collecting premiums after the crop is harvested in case no indemnity becomes payable. It may however be possible to provide for collection of premiums which remain unpaid as arrears of land revenue. The following extract will indicate the present position in the U.S.A.

> " Premiums may be paid any time after application is made; however they do not come due until harvest time. No interest is charged if the note paid within two months after it comes due."

(d) The term of the contract and safeguards against adverse selection. It is clear that a long term contract will have considerable advantages, since the premiums and indemnities are intended to balance over a long period of years. Work ability of a one-year term contract depends on the assumption that on an average those who go out and those who come into the scheme would on the whole balance in such a way as to create the same position as if contracts were in force over a long term. In particular it must be assumed that the bad seasons are not overweighted due to too many entrants entering the scheme during such seasons and leaving the scheme during the good seasons. The risk involved in this would of course depend on the degree to which prospects of a crop can be predicted at the time of insurance. A long term contract would prevent this from happening, since it must be necessarily more difficult to predict crop prospects of later seasons. Also the type of selectivity which results when, e.g., in cases where a crop rotation is usual, insurance is taken only when the crop is grown on the less fertile part of the holding

would be controlled if the period is at least equal to the crop rotation period. Attention may be given to this problem when it is usual to grow more than one crop in rotation on each holding.

It will be clear that a compulsory scheme of insurance will automatically ensure a long term contract. Also where the contract is based on the condition of an area, the selectivity of the type mentioned above will be less important. However, even then it will be possible that if crop prospects can be predicted bad seasons will be over-weighted. It must be remembered however that there is no way of effectiely ensuring a long term contract by preventing lapses, except by insisting on premium for entire period being paid in advance. Allowance must also be made for changes of ownership and tenancy.

Another method of encouraging insurance over long term, as also ensuring proper precautions against crop losses being taken, are provisions for reducing individual premiums, depending on the previous duration of insurance and incidence of losses. The U.S.A. contract provides for reduction of premiums on the following lines:

> "If a farmer has insured under the program for 5 continous years without an indemnity payment, his premium is reduced 10%. If a farmer's total paid-in premiums less his indemnities over a period of consecutive years equals his insured coverage, his premium will be reduced by 50%."

It is doubtful if before the cultivator is accustomed to the idea of insurance he will prefer a contract for a long period. Also a period of five years would appear to be too small to decide whether a surplus represents profits. The question of giving a rebate in the premiums payable in case contracts are continued from year to year may however be considered. If, e.g., it is decided to give a commission for selling insurance, an equivalent reduction in the premiums in case of early intimation of the intention to continue insurance for a subsequent season should be feasible. It may also be desirable to give an increasing reduction depending on the past duration of the contract; e.g. if a rebate of 3/4 of an anna in each rupee on the amount of the premium is given in respect of the second year of insurance, it may be increased by 1/4th of an anna in the rupee during each subsequent year, until a maximum rebate of 1½ annas is allowed during the 5th and subsequent years.

The provision in the U.S.A. scheme that the entire area in each cultivated holding on which the insured crop is sown must be covered by insurance should be adopted.

INVESTMENT INSURANCE PLAN IN INDIAN CONDITIONS:

14. There are certain elements of simplicity in the investment Insurance Plan described earlier as compared with the Yield Insurance Plan. One such element is that the sum assured, which is 75% of the investiment in the crop, is taken as a constant over a whole area. But a programme of this nature will need for its statistical basis a knowledge of variation of yields from one year to another although owing to the constant sum assured within an area certain limitations in the nature of statistics required are permissible. However, the element of price cannot be kept out of a programme of this type and this will constitute the main drawback in its application under Indian conditions until a price programme comes into force as in the U.S.A. It will be remembered that the indemnity payable in this form of insurance takes the form of the difference between the sum assured and the value of the crop in a particular year.

Chapter III.

Relative Advantages of a Voluntary and a Compulsory Scheme in India.

1. It is clear that before proceeding to discuss a detailed outline of the scheme and the necessary organisation, it is necessary to decide whether the scheme is to operate on a purely voluntary basis as in the U.S.A. or whether it will be made compulsory as is usual in case of programmes of social insurance. For this purpose, it is advisable to consider the question separately in relation to the initial experimental scheme and the scheme in its final comprehensive form. In its final form, to derive the full benefits which can accrue from a scheme of such character to the national economy, it is essential that it should comprise a substantial proportion of the cultivators within its scope. It is doubtful whether this could be achieved in India as quickly as may be desired without some measure of compulsion, supplemented of course with a process of educating the people in the value of such schemes and an attempt to make insurance attractive and cheap. In respect of the experimental scheme, divergent views are possible and have been expressed to me in course of my discussions with different persons. It may, therefore, be worthwhile to outline the main considerations in favour of the different views.

Case for a Voluntary Scheme.

2. It is unlikely that in its initial stages at any rate the cultivator could be educated into appreciation of the value of crop insurance and the protection it affords, especially as in many cases crop failures may be comparatively infrequent in occurrence. Compulsory insurance under such circumstances may be looked upon as an additional form of taxation and may provoke a feeling of resentment in the cultivator that may ultimately come in the way of appreciation of the scheme on its merits. Further, the scheme in its initial stages is to operate only in certain areas and in relation to selected crops; this may arouse a feeling, however, unwarranted that certain classes are discriminated against for additional taxation.

A compulsory scheme will have to take into account the ability of the marginal cultivator to pay the premiums. This may result in the need to limit severely the benefits under the scheme which may result

in failure to make it attractive or to restrict the compulsory nature of the scheme to only the classes of the cultivator who are better off. This may, however, be easily done, e.g. in various areas on the basis of the total assessment paid by the farmer; or by limiting insurability to farmers who will have to pay a premium larger than a prescribed minimum sum. If such a course is adopted,it will be desirable that those from the classes exempted from the compulsion who desire to take advantage of the scheme should be allowed to join the scheme on a voluntary basis. It is,however, possible that the cost of insuring some of the tiny holdings may be very heavy; in such circumstances benefits of insurance may be extended to such holdings by encouraging them to form insurance societies which should then insure as one unit. It is clear that such a provision may be necessary even in case of a voluntary scheme.

Under a voluntary scheme,different plans of insurance and plicies with different levels of coverage may be offered to suit the needs and tastes of the insured and their relative popularity tried. However, while such option may appear less natural under a compulsory scheme there would appear to be no reason against its use.

The areas of high risk of crop failure may be especially mentioned in this connection. It was suggested that as the value of insurance protection will be best appreciated in such areas,it may be easy to draw adequate voluntary response from the farmers in such areas under a voluntary scheme,inspite of the premiums being more heavy. On the other hand,it was felt that the exemption limits in cases of a compulsory scheme in such areas will have to be placed high. It should be remembered in this connection, however,that in such areas the size of holdings is likely to be larger,and the land revenue assessment lower; further what insurance proposes to do is merely to redistribute the heavy losses in certain years as a constant cost item every year. Insurance ,therefore,is merely a machinery to enable the cultivator to arrange and plan his budget over a number of years in a rational manner. It is true,however,that it may be worthwhile to secure the experience of insurance in such areas during the experimental stage.

A further argument in favour of a purely voluntary scheme is the tentative and exploratory character of the pilot scheme. To realise the full force of this argument it is essential to remember the nature of the incidence of losses under insurance of this type. Such losses will largely arise from causes such as drought which will be widespread over given

areas and may entail payment of vast sums in particular years. The experimental scheme is intended as a means of learning by experience and it is desirable that the cost of buying such experience should be reduced to a minimum. Two features of an experimental scheme will be of relevance in this connection:

(a)Only experience can show which various forms of mormal hazard and selection against the insurer,arise in the working of the scheme. In this connection the history of the scheme in the U.S.A. is instructive. Inspite of the extensive research that was conducted prior to the inception of the scheme, measures have had to be adopted from time to time to modify the plans to prevent operation of hazards that were discovered in its working,and even today the plans of insurance continue to be regarded as being in their experimental stage.The American experience is not directly applicable to Indian conditions; but nevertheless it will mean saving of time and resources to profit from the experience there to the extent that it applies. Unfortunately,the literature on the research conducted in America,and the reports of investigations on which modofications in the scheme are based are not available to me.

(b) In the initial stages at any rate insurance will have to be based on a statistical basis that is not entirely satisfactory,since such statistics as are at present available will have to be utilised inspite of their obvious limitations. In these circumstances, as in such stages the knowledge of risk factors and their importance will be inadequate,a voluntary scheme which limits the scope of insurance in force may not be a disadvantage.

However,in connection with these remarks it must be realised that experience gained in course of the experimental scheme will be of little value unless it can be utilised for extension of the scheme. This demands that the scheme should operate on an adequate scale and should draw an edequate degree of participation. The feasibility of a voluntary scheme will depend on whether a minimum degree of participation will be forthcoming within a reasonable period of time. It will be remembered that even in the U.S.A. where the scheme is purely voluntary, a minimum level of participation is prescribed.

Case for a Compulsory Scheme.

3. There are however powerful arguments in favour of a compulsory scheme in Indian conditions. Firstly, compulsion will simplify the working of the

scheme and secondly,it will remove the risk of adverse selection of a certain type that might otherwise creep in.

As pointed out above,it is to be expected that appreciation of the value of crop insurance on the part of the cultivator will grow by stages. It is possible that during the experimental stage there may be a tendency for the high risk farms to insure while the lower risk farms may not appreciate the value of insurance till later. In these circumstances it will not be possible to obtain the benefits of moderate premiums resulting from the pooling of risks between high risk and low risk farms in a given area and the schemes may therefore prove unattractive.

The point is also of importance from the point of view of the statistical basis used to determine the insurance cover and premium rates. In India,at present at least,owing to lack of yield experience in respect of individual farms extending over a period of years,date appertaining to larger units may have to be utilised with proper adkustments in formulating such basis. This procedure will clearly be more staisfactory if all the farms in the area or a representative sample of them are insured.

The original contract of wheat insurance in the U.S.A. was a one-year contract. The premium rates and insurance cover-age are, however,based on the experience of a long period of years and the fact that a farmer could insure only during a selection of years when crop-prospects were not good rendered the entire basis somewhat unsatisfactory. Thus,for exemple,the farmer could to some extent predict the prospects of a crop from the soil moisture conditions before seeding; or he could only take a policy when the area less suitable for a crop was sown; or he could utilise the results of a previous year's crop to predict in some measure the results of the next year's crop.This kind of adverse selection will be eliminated in case of compulsory insurance. Even in the U.S.A. longer periods of insurance are now in use. But there long term contracts have to meet difficulties created by changes of ownership, tenancy,possibility of lapses etc.

A compulsory scheme also has definite advantages from the ppint of view of costs. For one thing,it will obviously obviate the need for a separate agency of sell insurance. Secondly,the administrative costs of insurance naturally depend on the extent to which the insured units are concentrated within limited areas; this will be realised easily if the need for individual attention in course of the period of insurance to the insured units is remembered. Under a compulsory scheme,operation of the scheme could be limited to a similar

total area,there will be a more efficient use of the administrative organisation,and the administrative costs should be smaller.

Strict Uniformity not Necessary.

4. It will be clear from the preceding discussion,that a voluntary scheme will be quite feasible,provided it can secure an adequate degree of response. The extent to which this can be achieved will depend on the extent of education and economic well-being of the people of the particular areas,the co-operation of their leadership in ensuring the success of the scheme and the extent of effective publicity devoted to it. The decisions will be largely political and administrative in character and depend on local conditions. In these circumstances it would appear desirable to leave the choice between a voluntary and a compulsory scheme to the various local governments,without whose acitve co-operation the success of the scheme will be impossible of achievement. From the point of view of the experimental scheme itself,existence of compulsory and voluntary plans working simultaneously,will perhaps be an advantage.

Compulsory Crop Insurance in Dewas Junior.

5. A compulsory scheme of Crop Insurance has been in operation in Dewas Junior State since 1942. Crop Insurance is administered by a Corporation with a Managing Committee consisting of the Finance Member, the Revenue Member and the Village Development Officer, the last being the Secretary and responsible for actual administration. The machinery for premium collection is completely integrated with the machinery for land revenue collection.

The premiums are based on the actual assessment per acre. Three classes of policies are allowed,the benefits and premiums under Classes II and III being respectively three-fourths and one half of those under class I. Broadly speaking,the premiums for class I,are one-fourth of the land revenue assessment; so that in view of the option to take a policy of any class,compulsion applies in respect of a premium which is equivalent to only 1/8th of the land revenue assessment. The maximum benefits payable vary with the crops; but broadly speaking the maximum benefits under class I are about twice the land revenue assessment. Benefits are varied in respect of different crops,by prescribing in respect of each crop a different maximum annawari below which an indemnity will be payable; however, the rate of indemnity per anna of the lowering in condition is the same for all crops and is in fact equal to the premium.

Some suggestions for a mixed scheme.

6. It will be noticed that in view of the considerable advantages of different

forms which will result from a compulsory scheme it would be desirable that at least a part of the operations of the scheme should be on a compulsory basis. This will add considerably to the value of the experience obtained from the pilot scheme. The following suggestions may be made in this connection.

Areas where the insured crops are protected by irrigation or by an assured rainfall may prove suitable for operation of a compulsory scheme. In such areas the crop losses will be infrequent and perhaps less serious in extent. In view of this,the response to a voluntary scheme may prove to be meagre. On the other hand,owing to small seasonal variability in yields the crop insurance premiums in such areas will be small. Moreover, in wet areas the incidence of land revenue per acre will be large and the premium may represent a small fraction of the land revenue.

Further,the benefits in respect of which compulsion is applied should be limited. For example,in case the maximum benefit allowed under a Crop Insurance contract is two-thirds of the shortfall of the actual yield from 75% of the average yield, compulsion may apply in respect of a benefit one-third of such shortfall. Addition to the benefit up to the full amount permitted by supplementing the compulsory insurance by additional voluntary insurance should be permitted. One way of doing this will be to permit different classes of contract as in case of the Dewas Scheme. One advantage of very limited benefits will be that the dangers of basing insurance on an arbitrary price could thereby the minimised.

Lastly,compulsion may be applied to cultivated holdings of size above a certain prescribed minimum,depending on the crop; or those liable to payment of a certain minimum assessment. This will be desirable not only to prevent hardship,but also the reduce costs and perhaps in the interests of safety.

CHAPTER IV

SCOPE OF THE PILOT SCHEME FOR CROP INSURANCE

Objectives of the Pilot Scheme.

1. In defining the scope of a scheme it is necessary to keep in one's mind the essential objectives of an experimental scheme in Indian conditions. These may be stated as follows:

(i) To study the technical aspects of the plans of insurance; need for modification in the plans in the light of experience; relative value and popularity of different plans of insurance.

(ii) To evolve methods and machinery for efficient administration, and to get an indication of costs of the various operations involved in the administration.

(iii) To educate the cultivator and his leaders into appreciation of the value of insurance and demonstrate its workability. It is clear that apart from effective publicity, the working of the scheme and the help that it can render during years of distress can alone bring home the value of insurance to the cultivator.

(iv) Training a body of persons in various areas in the various aspects of administration so as to form a nucleus of personnel for extension of the scheme.

(v) Obtaining the necessary data to serve as a satisfactory basis for a more comprehensive scheme, directly in course of the working of insurance, and also by appropriate enquiries in the area of operation of the scheme.

Selection of Crops to be Insured.

2. The first step will be to select the commodities in respect of which insurance is to be offered. It will obviously be appropriate to begin with crops of major importance in Indian economy. In this connection the distinction between the food crops and commercial crops may be relevant. While food crops cover about 80% of the cultivated area, the commercial crops are of undoubted importance in Indian economy as supplying the raw materials for the major industries, and forming the chief articles of export. Moreover, within certain areas they will be of major importance and the need for insurance protection in respect of them may be higher,

since their production involves greater care and investment. The ability of the cultivator to pay the premium may also be greater in case of commercial crops. It is suggested, therefore, that in the initial stages of the experimental scheme, insurance may be confined to two food crops, viz. rice and wheat and two commercial crops, viz. cotton and sugarcane.

Criteria for the Selection of Areas of Operation of the Scheme.

3. The next step will be to decide on areas suitable for the operation of the scheme and their extent, in respect of each of the selected commodities. It is suggested that the following considerations should govern the selection of such areas:

(i) The selected areas should be broadly representative of the various producing areas in respect of the different commodities. In deciding on the representative character, factors like farming practices, production risks, soil types, varieties and qualities of commodity grown, geographical distribution, size of the farm and the extent of concentration of the insured commodity, potential demand for insurance may be taken into account. It is clear that the representative character of the areas will enable extension of the scheme to similar areas, and promote the educative aspect of the scheme. Further, since the need to make the areas representative will result in spreading them geographically, this will incidentally provide a factor of safety in the scheme, by spreading the risk of crop loss over a wide area. This is of value in view of the risks in this type of insurance tending to be concentrated in a few areas.

(ii) Existence of basic data of sufficient reliability to serve as a preliminary basis for the scheme. This point is discussed in detail in another section of the note. But it may be pointed out that in view of this consideration, it would appear advisable to leave out the permanently settled areas in the first instance.

(iii) Existence of suitable agencies that could be utilised for working of the scheme.

(iv) Consideration of costs of administration of the scheme. Insurance may be offered in the areas of concentrated produc-

tion of the insurable commodities where the income from the insurable crops forms a major proportion of the agricultural income. It is clear that a sparse distribution of the insured units must mean higher costs. Further, it is clear that from the point of view of the cultivator, it will not be worthwhile offering insurance protection in respect of only a minor part of his farming operations.

(v) Consistently with the above considerations, existence of conditions suitable for success of the scheme. Among these may be mentioned, the general economic well-being of the cultivator, extent of his education and progressive outlook, public and official leadership interested in agricultural reform, etc. As it is feared that conditions in East Punjab may continue to remain unsettled for some time, and in view of the probable discontinuity between the past and the present in the sphere of agricultural economy in that province, it may perhaps be considered advisable to exclude this province also from the scope of operations of the experimental scheme.

Practical Procedure for Selection of Areas.

4. It is suggested that the following practical procedure may result in selecting areas which broadly speaking will give due effect to these considerations:

(i) For each commodity insurance may be confined to the major producing provinces in respect of that commodity.

(ii) Within each such province there are usually well marked regions of concentrated production. Insurance may be further confined to such regions, except when it is desired to select additional areas to derive experience under particular conditions, such as high risk of crop failture.

(iii) The ultimate selection may be effected in terms of suitable units utilised for revenue administration. This will be desirable since (a) existing agricultural statistics largely relate to such units, and (b) it will be convenient to utilise revenue agencies for administration of crop insurance.

Further, such selection may be done in consultation with local officials, with a view to selecting areas where crop-insurance will have

the greatest chance of successful operation.

Necessary Information about Distribution of Crops.

5. The following information about the distribution of the crops in India may be of interest in this connection. The figures refer to the pre-war period 1936-7 to 1938-9.

(a) RICE:

(i) Total Rice Acreage in Indian Provinces : 50.6 Million acres (= 29.5% of the total cultivated area).

(ii) Major producing provinces, and acreage under rice in each province, expressed as percentage of area under rice in all Indian provinces. Madras (25.8%); Bihar (17.2%); West Bengal (15.4%); U.P. (11.3%); C.P. & Berar (9.5%).

(iii) Districts in the different provinces in which production is concentrated, and the acreage under rice in each expressed as percentage of the total provincial acreage under rice:

Madras: Vizagapatam, West Godavari, East Godavari, Kistna (35%); Tanjore (12%); Malabar and South Kanara (14%)

U.P.: Gorakhpur Division (28%); Fyzabad Division (25%)

C.P. & Berar: Raipur (27%), Bilaspur (23%) and Drug (14%)

(b) WHEAT:

(i) Total wheat acreage in Indianprovinces: 17.5 Million acres (= 10.1% of the total cultivated acreage in Indian provinces).

(ii) Major producing provinces, and acreage under wheat in each province expressed as percentage of area under wheat in all Indian Provinces : U.P. :(50.6%); East Pujab (22.0%); C.P. & Berar (12.4%).

(iii) Districts in the different provinces in which production is concentrated, and the acreage under wheat in each, expressed as percentage of total provincial acreage under wheat:

U.P.: Gorakhpur Division (19%); Meerut Division (15%); Fyzabad Division (14%); Lucknow Division (14%)

C.P. & Berar: Saugor (17%); Hoshangabad (13%).

(c) COTTON:

(i) Total cotton acreage in Indian provinces: 11.5 Million acres (= 6.7% of the total cultivated acreage in all Indian provinces).

(ii) Major producing provinces and acreage under cotton in each expressed as percentage of the cotton acreage in all Indian Provinces:

C.P. & Berar (33.8%); Bombay (32.7%); Madras (20.2%).

(iii) Districts in different provinces in which production is concentrated, and acreage under cotton in each expressed as percentage of total provincial cotton acreage.

C.P. & Berar	Akola (25%); Ammoti (25%); Yeotmal (22%); Buldana (19%).
Bombay	East & West Khandesh (40%); Dharwar, Bijapur and Belgaum (21%); Ahmedabad, Broach & Panch Mahals, Surat, Kaira (29%).
Madras	Bellary (25%); Coimbatore (15%); Tinnevelly (13%).

(d) Total sugarcane acreage in Indian Provinces: 3.1 Million Acres (= 1.8% of the total cultivated acreage in Indian Provinces).

(ii) Major Producing Provinces and acreage under sugarcane in each expressed as a percentage of sugarcane acreage in all Indian provinces:

U.P.: (67.1%); East Punjab (9.0%); Bihar (12.8%).

(iii) Areas in which production is concentrated, and acreage under sugarcane in each expressed as percentage of provincial sugarcane acreage:

U.P.: Meerut Division (22%); Rohilkhand Division (21%); Gorakhpur Division (18%).

Firka - A Suitable Unit Area.

6. Having selected centres in which the scheme of insurance could suitably operate, the next step will be to discuss the extent of the total area in each such centre. It will be clearly convenient to define such areas in terms of primary units of suitable size. Such a unit used in the U.S.A. is a county and the Federal Crop Insurance Act as amended in 1945 visualised extension of trial insurance to new commodities through a period of trial insurance, the operation of which was limited in extent to not more than 20 counties in respect of each commodity and in time to a period of not more than 3 years. Further, certain minimum participation

requirements were also to be satisfied in respect of each such country; these are discussed later.

In view of considerations indicated above, in India a suitable unit of revenue administration may be utilised; taking the sizes of the various units into consideration, a revenue inspector's circle appears to be a suitable area. There are generally four or five such circles in a tehsil, though the number of villages comprised within a circle varies considerably, being nearly 30 in Bombay and Madras but nearly 150 in C.P. and U.P. Suitable allowance for varying sizes can of course easily be made.

It is obvious that the total extent of the area for operation of the scheme will depend on the decision whether the scheme is to work on a voluntary or a compulsory basis.

In case of a purely voluntary scheme, there is no basis at present to serve even as a broad indication of the expected degree of response. It must be remembered, however, that in India the purpose of the experimental scheme is itself to educate the people into utilising insurance protection; a growing response should therefore be a measure of the success of the scheme. However, assuming broadly a 5% participation in the initial stages of the scheme, and an average of 200 farms in a village, there may be on an average 300 insured farms in a firka of 30 villages. It may be remembered that in the U.S.A., in 1947 there was a participation of 33% in the areas where the trial insurance on tobacco operated.

A RIGID MINIMUM PARTICIPATION REQUIREMENT - NEITHER FEASIBLE NOR DESIRABLE.

7. The question whether a minimum participation requirement should be prescribed in respect of each insured country, as in the U.S.A. Scheme may be discussed at this stage. In the U.S.A. such a limitation was prescribed for the first time in 1946, under the amended Act in that year. No insurance was to be offered in any county unless a minimum of 50 farms (or one third of the total number of farms in case the farms producing the insurable commodities were fewer than 150) applied for insurance. This minimum applied to all commodities combined. A more stringent provision is laid down under the 1947 amendment to the Act. Under this amendment, insurance cannot be provided in any county unless 200 farms or one third of the total number of farms normally producing the insured commodity, whichever is smaller, apply for insurance. Moreover,

this minimum applies to each commodity separately where two or more commodities may be insured in any county.

The objects of such limitations were : (1) A considerable saving in administrative costs could be secured by not permitting insurance where the interest in insurance is limited. It has been pointed out, however, that only the cost of servicing contracts was saved since the expenses of calculating premium rates and insurance coverages which form a considerable proportion, could not be eliminated. (2) There was a feeling that those interested in insurance may persuade others to insure so as to make up the minimum limit. (3) The feeling that a larger and more representative group of the insured producers would result in less selectivity against the scheme. The last reason was considered to be the primary reason for the limitation in 1947, but the first two had been stressed in 1945.

Under Indian conditions assumption of a degree of participation comparable to the U.S.A. is of course out of question. In fact while in the U.S.A. at the inception of the scheme a demand for insurance protection was taken for granted, in India one of the objectives of the schemes may be said to be to create such demand. The question of costs therefore must be visualised in the different light.

A second relevant consideration is in relation to the size of the cultivator's holding. Roughly speaking, the average acreage per insured farm in the U.S.A. is roughly 30 acres, except in case of tobacco where it is only about 4 acres. In India the average acreage per cultivator's farm is bound to be much lower. The following figures for acreages per cultivator's holdings in different Provinces may illustrate this point: Bombay , 16.8; C.P. 12.0; Punjab 8.8; Madras 6.0; Bengal 4.0; Assam 3.4; U.P. 3.3; Bihar and Orissa 3.0. On the other hand, it is probable that in the initial stages at least, the better farmer may be attracted into the scheme and the average size of the insured farm may be larger than indicated by figures given above.

This point may also have a bearing on the possible selectivity against the scheme resulting from low participation. To the extent that the better type of the farmer is attracted to the scheme, such selectivity will be minimised.

One further point may also bear mention here. In the U.S.A. adequate data existed before experimental schemes started. In India such

data as exist are much less satisfactory and more adequate data will have to be obtained as a result of the working of the experimental scheme itself. A more adequate participation would no doubt add considerably to the value of such data; but it seems unlikely that in the initial stages at any rate such adequate participation will be forthcoming. In these circumstances supplementary schemes will have to be worked together with the main insurance scheme to obtain the necessary data. Further if a time limit is visualised it will have to be atleast 5 or 6 years. It must be remembered that under a voluntary scheme many of the insured farms may remain within the scheme for only a part of the period. Further, owing to practices like crop rotation, data vailable in respect of a particular commodity must refer to a part of the period.

It will be clear from the foregoing remarks that a rigid limit for minimum participation will not be feasible in Indian conditions. Attention will have to be given to the potential response rather than actual participation at the inception of the scheme. On the other hand it is necessary that as large a participation as is possible should be ensured; this will not only reduce costs but also will add to the value of the experience derived from the scheme. It may be suggested that the best course would be to take the degree of potential response into account in selecting areas within the regions of concentrated production in each province. This should be left to be judged by the local officials or some indication about the extent of participation may be obtained by actual local enquiries in course of the preliminary local studies that will be necessary before the scheme comes into force.

Extent of area for Each Crop and Its Distribution over Provinces.

8. The total number of insured farms under the trial schemes for crop Insurance in 1946, were respectively 8,800 under corn and 13,000 under tobacco. It may be suggested that voluntary insurance in respect of each commodity in India may be roughly limited to about 20 firkas so that on the assumptions made above, there may be nearly 6,000 farms within the scheme. The total area so selected may approximate to the area of about an average distrct in respect of each crop.

The number of units selected in any province could be made roughly proportional to the proportionate area under the particular crop in the regions in the province represented in the scheme. Attention may

also be paid to the relative homogeneity of the regions within each province. If for example, there is only a single region of considerable dimensions fewer contigous units may suffice; while if there are two or three distant regions a larger number of units would be justified.

Another consideration that will be relevant is the total number of insurance units within each province, so as to justify an organisation being set up in the province. Where only one commodity is insured in a province a slightly larger area of operation may be justified, as compared with provinces where more than one commodities are insured.

9. The discussion in the last two paragraphs relates largely to a voluntary scheme of insurance. As pointed out earlier, there will be considerable simplification in case of a compulsory scheme; and insurance may be confined to one firka in respect of each homogeneous region in respect of a commodity

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C_H_A_P_T_E_R V

ORGANISATIONAL SET-UP FOR CROP INSURANCE UNDER INDIAN CONDITIONS

Suitability of State-management as against Management by Local Bodies and Private Companies

1. Before proceeding to outline the nature of an organisational set-up to administer Crop-Insurance in India it may be worthwhile considering the relative merits of different agencies which could be utilised to undertake such a scheme. Such a scheme may be managed entirely by the State, as is done in the U.S.A.; or by local bodies like co-operative institutions or by joint stock companies. Both latter types of organisations have been utilised for administering crop-insurance against wind-storm. In France, hail insurance is effected by co-operative organisations and by joint stock companies; they received help from the state by way of subsidy and from the Agricultural Credit Bank by way of loans. Private insurance companies undertaking hail insurance, with insurance contracts regulated by state and general state supervision of the working, have existed in Germany; also a scheme was in operation there under which the state made payments to the private insurance companies in addition to the payments made by farmers. Public hail insurance institutions have also operated in Germany, with the help of foundation capital and annual grants supplied by the State. In the U.S.A. mutual property insurance companies, insuring against hail and wind-storm, many of which confined their working to a single state have existed for some time. Even in the case of all-risk crop insurance in the U.S.A. the amended legislation of 1947, visualises the entry of private industry into the field of all-risk crop insurance. The new amendment includes a provision whereby the Federal Crop Insurance Corporation may reinsure private insurance companies which insure producers of agricultural commodities under contracts acceptable to the Corporation. However, reinsurance is limited to 20 counties selected by the Board of Directors of the Corporation.

2. Certain features of agricultural insurance can usefully be borne in mind in deciding on the suitability of different types of organisations. The following remarks made before all-risk insurance came to the fore-front, may yet be of value in this connection:

"The technique of agricultural insurance is influenced by two special features. One of them is that it has to deal with policyholders who often live at considerable distance from one another, necessitating a wide-spread

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net of agents and inspectors and involving a considerable higher cost of operations. The second feature is that close local supervision of the policyholder and of the insured object is of paramount importance. The personal character of the Policyholder and the care exercised by him over his household, his live-stock, machinery etc., in a word, the moral hazard is of greatest significance in many branches of rural insurance. It has also a direct bearing on the cost of insurance and the actuarial calculation of premiums. To ordinary insurance companies for which it is very difficult to be in close personal contact with the rural policyholder the moral hazard is naturally too vague and impossible of prediction. Their rates are, therefore, often prohibitive to the farmer. On the other hand, non-profit making insurance organisations by the farmers and for the farmers, can make full use of mutual control and supervision by the members and thereby diminish considerably the moral hazard and cost of insurance". ('Co-operative Insurance' by N. Barou - p. 191).

3. In a subsistence economy such as the one prevailing in India today, the ability of the farmer to pay the premium is a consideration of primary importance; and conseqently the least expensive form of organisation must perhaps be considered as the best. Private companies are at a disadvantage in this respect, even if some scheme of supplementing the cultivator's own premiums by the State could be devised. In the U.S.A. Government pays the cost of administration; in India perhaps a more adequate subsidy may be necessary at least in case of certain classes of cultivators. It is clear that under a state managed scheme there will be more scope for attemtps to meet the varying needs of different classes of cultivator . Further, Government has already accepted responsibility for relief of agricultural distress, through a system of suspensions and remissions of tax and other positive measures of relief during famines and a scheme of crop insurance on an adequate scale should be integrated with such other schemes.

The most obvious features of any comprehensive scheme of crop insurance combining yield insurance with the idea of storage commedity reserves, is the vast scale of its operations and the size of the organisation needed to administer it. Moreover, spreading of risks by operating in extensive areas is a necessary condition of success of the programme. It seems doubtful whether private enterprise would have the necessary resources for or interest in setting up the elaborate organisation in rural areas that alone could make the scheme feasible.

Further, as the U.S.A. example has shown, a preliminary stage of experimentation on an adequate scale must necessarily be visualised before finalising the plans of insurance and the type of necessary organisation. Further, in conditions of agricultural statistics in India a begining may have to be made with a basis that is not entirely satisfactory. It is unlikely that private enterprise will be willing to face the cost of experimentation on such a scale, especially as the profits from this form of insurance must in any case be limited.

As compared with private enterprise, the state has certain advantages in undertaking this form of insurance. In the revenue organisation which has spread to the remotest village it has an agency whose vast experience of village conditions could be effective in substantially reducing moral hazard; and if adequately supplemented, this agency could be utilised to perform most of the field functions necessary for administration of crop insurance. In fact it will be impossible for a private company to find the necessary staff of comparable experience and dependability. Further, in India the State alone could inspire the necessary confidence in the illiterate cultivator and its various agencies for educating him into appreciation of the value of efficient agricultural techniques could be utilised to popularise crop-insurance. Further, for its effective working as well as for deriving the maximum benefit from it, the programme of crop insurance should be worked together with other programmes of agricultural reform, which are accepted to be the responsibility of the agriculture and other departments of the Govt. It is desirable therefore that responsibility for all such programmes should be with the same agency.

As indicated above, there are strong arguments in favour of Crop Insurance being managed through a network of local societies organised on co-operative principles, with regulation and help from the State. As pointed out above this will be necessary not only for political considerations, but also because local societies could reduce moral hazard and the costs. It is desirable, therefore, that the possibility of utilising the co-operative movement to further the crop-insurance programme should receive careful consideration. Under the present conditions however, it would appear that the scale of operations necessary for even a moderately successful crop insurance plan may prove too vast for the resources of our cooperative system for many years to come. The Cooperative Planning Committee has expressed the following

view in this connection.

"Crop Insurance in India in the present circumstances appear in our opinion beyond the scope of private agencies or co-operative organisations; firstly by reason of the lack of reliable technical data; and secondly because of the inability of the pesantry to bear the incidence of the cost". It will appear, therefore, that during the experimental stage at any rate the co-operative movement could play only a secondary role. It may be pointed out, however, that unless the form of the crop insurance contract could be substantially simplified, it may be difficult to work it through the co-operative societies. The services of cooperative organisations and other institutions interested in agricultural development could, however, be utilised to popularise insurance, and as agents to sell insurance. Such societies could sell insurance on a commission basis. Policies insuring collectively the membership of cooperative societies at special rates could be evolved. Small holders could form themselves into insurance societies and insure as one unit.

4. It seems therefore necessary to proceed on the basis of a mainly State-managed scheme of Crop Insurance in India, at least during the experimental stage. The actual working of the scheme, when the scale of operations of the scheme is extended beyond the pilot scheme stage, may be entrusted to a Government Corporation on the lines of the Federal Crop Insurance Corporation in the U.S.A. which works within the U.S. Department of agriculture. It may also be possible in this way to associate with the actual management of scheme non-official persons of experience by providing for nomination of a certain number of non-official persons on the Board of Directors, as has been recently done in the U.S.A.

At present such a scheme of all-risk Crop Insurance has only existed in the U.S.A. and a detailed study of the nature and working of the organisational set up there should prove invaluable. The literature available to me on the evolution of the organisation to its present form, is however, exceedingly limited and the information given in the appendix is intended merely to delineate the broad features of the organisation and is based mainly on the annual reports of the working of the Corporation.

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Main Operations involved in the Administration of Crop Insurance

5. The brief outline of the nature and functions of the various agencies in the U.S.A. given elsewhere, will help to form an idea of the main operations necessary in the course of the administration of Crop Insurance with a type of contract based on the conditon of the individual farm. With reference to Indian conditions these may be listed as follows:-

(i) Functions of the central body: Evolving plans and actuarial basis; collecting, collating and analysing necessary statistics; deciding questions of general policy regarding scope of insurance etc.

(ii) Organising the selling of insurance. Publicity.

(iii) Calculation of premiums and insurance coverages appropriate to the various areas according to the procedures laid down by the central body.

(iv) Collection of premiums and checking acreages.

(v) Laying down minimum standards of agricultural practices.

(vi) Carrying out routine inspection to see that these are followed.

(vii) Receipt of notices of apprehended losses and their transmission.

(viii) Carrying out inspections for loss adjustment:-
To permit release of acreages for other crops,
to determine the extent of losses and the stage at which they occurred, before and after the harvest.

(ix) Supervision of loss adjustment work, reviewing claims.

(x) Collection of stastics in the manner suggested by the Central Office.

(xi) Keeping records, receiving premiums, accounting and auditing functions, processing claims.

(xii) Functions connected with storage reserves.

Provincial Field Agencies Which could be utilised for Crop Insurance Administration -

6. Suitable agencies to whom the various functions specified above could be assigned may next be considered. So far as the field functions relating to Crop Insurance are concerned, there are at present two

different field agencies in the various provinces, who properly supplemented could be counted on to undertake a major share of such functions. First, there is the field agency related to land revenue administration and second, the field agencies of the various agricultural departments.

We may start with the land revenue agency in the temporarily settled areas. This has the village revenue officer (karnam or patwari) as its basis. The normal duties of the Patwari include operations similar to those required for working a Crop Insurance programme. He records acreages under different crops in each field under his jurisdiction in every season. He has also to report the condition of the crops under his jurisdiction at regular intervals. In Madras, I understand, the condition of every field is reported. Further, in connection with remissions and suspensions of revenue dues, he has to perform duties similar to loss adjustment work. Collection of revenue dues and keeping accounts are also part of his functions. He enjoys considerable prestige in the village and possesses considerable knowledge of the locality. It is clear, therefore, that the Patwari should prove a great asset to the successful working of a programme of Crop Insurance. His local knowledge should go a long way to prevent malfeasance and to reduce moral hazard whilst his official status should add to his value as compared with other local people. Next in hierarchy comes the revenue inspector in charge of a firka and the officer in charge of the tahsil or taluka. The duties of these officers involve personal contact with the cultivators and include frequent touring and crop inspections and their prestige among the villagers should promote smooth working.

There also exists a field agency consisting of District Agricultural Officers, Agricultural Assistants and Kamgars, which also possesses considerable local knowledge obtained in course of the conduct of various programmes of agricultural departments. As has been pointed out Crop Insurance should be considered as an integral part of a well rounded programme of agricultural reform and utilisation of this agency would be appropriate. This agency however, is much less elaborate than the revenue machinery; and further the type of field to field knowledge, and preoccupation with crop conditions which the revenue agencies possess make the latter a comparatively

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more valuable agency for purposes of crop insurance administration. However, the services of the agricultural field staff could be utilised in other ways. Publicising and popularising agricultural programmes is an essential part of their duties and crop insurance could be included among such programmes. Further, administration of crop insurance would involve a detailed local study of agricultural practices in various areas, and effect of variations in agricultural practices, so that a minimum standard of efficiency could be laid down and variations allowed for. In this aspect of the work the experience and knowledge of the agricultural staff would be invaluable.

The position in the permanently settled provinces may also be mentioned here. A beginning has already been made in such provinces towards creating a suitable primary agency for crop reporting; and I understand there are at present one officer in charge of every 10 villages in Bengal, one officer in charge of every 15 villages in Bihar and one officer in charge of every 30 villages in Orissa.

Suggestions for an Organisation for the Pilot Scheme -

7. It may be suggested that under a voluntary scheme, the work of selling insurance, collecting premiums, checking acreages, carrying on routine inspections and receiving and transmitting notices of apprehended losses should be left to the Patwari. Part of the work is the normal routine for him, and inspections could perhaps be combined with the crop reporting work. As the number of insured farms in a village is not likely to be substantial under a voluntary scheme the Patwari could easily undertake the requisite work in addition to his normal duties and the payment to him may take the form of a suitable sum per contract in force.

The work of adjusting losses is of a responsible character and the status of the officer concerned may have a bearing on its being done smoothly; it would be advisable therefore to assign it to an official of a status higher than the Patwari. In the revenue agency, the Revenue Inspector in charge of a Firka would appear to be an appropriate authority for the purpose. It may be advisable, however, to provide for an independent officer, free from any suspicion of bias entering his work as a result of his other functions, to undertake this work. A Crop Insurance Assistant may be assigned this work in

respect of each centre in a Province. He could be assisted when necessary by the Revenue Inspector concerned.

It will be remembered that in case of a contract based on the condition of an area it has been suggested that Crop loss adjustment may be done on the basis of estimates of a season's yield obtained through a crop cutting survey on principles of random sampling. This may involve a few crop cutting experiments being undertaken in each village and the work could in course of time be entrusted wholly to the Patwari, and a certain degree of supervision provided for. As has been pointed out this work may take the place of the work the Patwari is supposed to do at present. It will be desirable, however, during the pilot scheme stage to provide for very adequate supervision of the Patwari's work and as suggested earlier this may be done by utilising the services of full time supervisors on a temporary basis during the harvesting season. The function of the officer in charge of each centre will therefore be mainly to plan and coordinate this work of supervisors and in addition to arrange for crop loss adjustment in case of 'local calamities'. The Crop Insurance Assistant may also be assigned the organising work in his centre, and in case of a scheme on a voluntary basis with limited participation may also be able to do a major part of the clerical work in respect of the centre. As the scheme developes, a good deal of the clerical work could also be assigned to the patwari.

A Crop Insurance Officer may be made responsible for the Crop Insurance work in each province. He will be given necessary clerical assitance and the Crop Insurance Assistants who work in the different centres in the province will be responsible to him. He will, with the help of his staff and Crop Insurance Assistants carry out the following duties:

(i) Organising selling of insurance and publicity within the province. For this purpose he may utilise the services of popular institutions interested in agricultural development, multi-purpose societies and field agencies of the department of agriculture. He may also appoint agents on a commission basis.

(ii) Computing premiums and insurance coverages appropriate to the various areas, on the basis prescribed by the Central Office.

(iii) Keeping records, receiving premiums, maintaining accounts and processing claims.

(iv) Supervision of loss adjustment work and review of loss claims.

(v) Organising collection of statistics in the form demanded by central office.

(vi) Studying the agricultural practices and formulating minimum standards; studying costs of production in the different areas.

(vii) Inspections to check work at all levels.

In addition to these agencies there will be a Central Office to whom the Provincial Crop Insurance Officer will be responsible. The functions of this office will be similar to those of the Central Office of the Federal Crop Insurance Corporation.

It may be pointed out that it is not necessary that there should be strict uniformity in the field organisation in the different provinces. Local variations in the agencies to suit local conditions may be permitted.

It will be notice that no reference has been made to the problem of creation of storage reserves and the organisation therefor. On the scale on which the experimental scheme will start it is doubtful if it will be worthWhile establishing the full machinery of storage reserves in the early years; it may be possible to proceed on the basis of monetary equivalents.

8. A point that may be usefully stressed at this point is the comparative cheapness of a compulsory scheme in relation to the extent of insurance. In this case a part of the cost will remain the same inspite of the much larger degree of participation. The Central Office and the Provincial Head Quarters staff would remain the same; also in case of a contract based on the condition of an area the crop loss adjustment work will remain unaltered. Also perhaps the area in each centre in each province over which the operations of the scheme extend could be reduced and the number of Crop Insurance Assistants may not increase very much. It will be easier to integrate the work with the normal revenue work and the clerical work may be done largely by the patwari or by cheaper clerical staff given to each Crop Insurance Assistant. A compulsory scheme will, therefore, have much to commend it from the point of view of costs.

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9. It will be noticed that in the foregoing remarks only the nature of the paid organisation has been indicated. In addition it will be essential for the success of the scheme to enlist the sympathies and co-operation of official and non-official agencies in each province and in each centre in each province in which Crop Insurance is offered. It will be remembered that one of the main objectives of the pilot scheme is to educate the cultivator into appreciation of the benefits of Crop Insurance and for this purpose it is essential to seek the co-operation of his leaders and of the various agencies in whom he has faith. Local Committees may for this purpose be set up in each centre in which the scheme is administered and this may consist of both officials responsible for the various allied programmes and non-officials who may represent such popular institutions as Panchayats, co-operative societies of various types, etc. It will be advisable, in addition, to have Provincial Advisory Committees in each Province and perhaps existing bodies may be available to work in this capacity. A Managing Committee will also be set up to guide the policies at the Centre.

C H A P T E R VI

ACTUARIAL BASIS FOR CROP INSURANCE IN INDIA.

A NEW METHOD FOR COMPUTING PREMIA FOR CROP INSURANCE

1. The method for computing premia for Crop Insurance used in the U.S.A. may be described as being essentially based on the idea that the set of yields obtained on a farm during a representative period in the past will be broadly repeated over a similar period in the future. Hence the average indemnity that would have been payable in case the farm had been insured during the past representative period is taken as the appropriate premium for insuring the farm.

The method for computing the premium for an individual farm used in the U.S.A. as applied to a contract with benefits limited as stated earlier, may be described as follows:

During a period of m seasons considered as representative period for the crop concerned, let xk denote the yield per acre during the k th season, so that the average yield during the period is $x' = (S\ xk)/m$. The maximum insurance coverage per acre for the farm, payable in the event of a complete crop failure is then $x'/2$. In the event of a partial crop failure indicated by yield lower than 75% of the average, a fraction of this maximum indemnity proportionate to the shortfall of the actual yield of the season from a 75% yield is paid, i.e., the indemnity will be equal to $\frac{1}{2} x' \times (0.75\ x' - xk) / (0.75\ x') = 2/3(0.75\ x' - xk)$. Thus if the indemnity during the k th season be denoted by Yk, Yk will be equal to 0 if xk is greater than or equal to $.75\ x'$, and equal to $2/3(0.75\ x' - xk)$ if xk is less than $.75\ x'$. The average indemnity during the representative period is S(yk)/m and this is taken as the appropriate premium for the farm on the U.S.A. basis.

It will be seen that the premium computations, therefore, take account only of the variation in yields during the years when an indemnity would be paid, i.e. under normal forms of contract the years when the yield falls below 75% of the average yield for the farm. Now, deviations from the average of such extent occur only rarely and the premiums so computed therefore tend to vary substantially with the actual past period to which the date relates, unless the period is of a considerable length. Data of yields extending over large periods are rather difficult to come across and the method will therefore be of a rather limited use.

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Further, when premiums are computed by this method, it is not at once clear what difference between premiums for different farms indicate real differences in seasonal variability and what differences arise out of merely accidental variations; it is comparatively much easier to appreciate the significance of comparisons of measures like coefficients of variability.

2. As an alternative, a method which would take into account every variation in the yield which occurs during the period may be expected to provide a stabler estimate of seasonal variability and consequently of the premiums that may be derived from such estimates. It is suggested therefore, that as an alternative to the method used in the U.S.A., the standard deviation or the coefficient of variability may be used as an estimate of seasonal variation and that premiums may be derived by assuming that the seasonal deviations from average yield of a farm would be normally distributed. It may be pointed out that this assumption would be no more arbitrary or unreasonable than the one underlying the U.S.A. method of premium computations. A further advantage of the suggested method would be that it will be easier to estimate the effect on the premium rates consequent upon different variations in the average productivity and coefficients of variability.

The suggested method may be described as follows: It is assumed that the actual yields per acre on a farm are distributed normally and that as usual the mean x' and variance s^2 of an observed distribution would provide estimates of the mean and variance of the normal distribution. As above, if x is the actual yield, an indemnity equal to $2/3(0.75\,x' - x)$ will be payable when x .75 x'. The mean value of this quantity will represent the appropriate premium. It is found that if the coefficient of variability = $100\,s/x' = 25/k$, the premium may be expressed as $x' \left(\exp\left(\frac{-k^2}{2}\right) - A(k)\right)$ where $A(k)$ represents the area of the tail of the standardised normal curve, to the right of the ordinate $x = k$. If the coefficient of variability be known, the premium can be expressed as a percentage of the average yield per acre. Premiums calculated on this basis, and corresponding to different coefficients of variability and average yields, are shown in table I.

It will be seen that this method enables the premium to be expressed as a percentage of the insurance coverage as soon as the coefficient

of variability is known. The actual premium may then be obtained by combining this with an appropriate estimate of average yield. This separation of the two elements entering into premium calculations, viz. long term average yields and coefficient of variability is a great convenience. It will enable estimates of average productivity and coefficient of variability derived from different sources to be combined. It will also facilitate allowance being made for different factors which affect productivity, such as improved varieties, manures, varying soil classes, etc.

Nature of statistics required for a basis for Crop Insurance

3. In order to appreciate the nature of the statistics required for Crop Insurance, it is useful to distinguish between the importance of the two factors which enter into computations of insurance coverage and premium rates, viz. the long term average yield and the coefficient of seasonal variability, from the point of view of the workability of a scheme of Crop Insurance on the U.S.A. basis under which crop losses are paid in relation to the condition of the insured farm. For simplicity of exposition the full benefits allowed in the U.S.A. will be assumed.

A contract of Crop Insurance on the U.S.A. basis is not feasible unless at least an approximation to the individual farm yield is possible. As pointed out before, insurance takes the form of guaranteeing a proportion of the long term average yield, and making up the deficiency in any year below this proportion by means of an indemnity. The effect of over-estimation of yields under this form of contract may be clarified by means of a numerical example. Suppose the long term yield of a farm is 400 lbs. and on this basis a coverage of $\frac{3}{4}$ x 400 = 300 lbs. is assured. It is clear that as soon as the probable actual yield in any year approximates 300 lbs., the incentive to put in sufficient effort weakens, since 300 lbs. will be obtained under the contract in any case and no advantage is to be obtained, e.g. in trying to get a yield of 275 lbs. rather than of 250 lbs. Now, suppose that the true yield is over-estimated and taken as 500 lbs. On this basis the coverage will be 375 lbs. which is only 25 lbs. below the true yield of 400 lbs. Thus a figure nearer to the true yield being guaranteed, the moral hazard comes into play at a much higher level, with disastrous consequences. Further, it

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must be remembered that smaller deviations in yield from the average would normally occur more often than larger deviations. This will also have an effect on the frequency and size of the indemnity. Under the original contract an indemnity would be payable when the yield falls below 300, i.e. a deviation of 100 from the true average occurred; now an indemnity is payable as soon as the yield falls below 375, i.e. a deviation of only 25 below the true average occurs and as stated above, such smaller deviations occur oftener. Thus indemnities will now be payable when they would not be payable under conditions of an accurate estimate of yield, and the size of such indemnities would be larger since the actual yield would have to be made upto 375 lbs. and not only 300 lbs. It will be clear therefore that the use of a constant yield figure in areas where the yields vary considerably, will result in over-estimation of yields in case of farms with poorer productivity. The under insured farms will draw indemnities only rarely and these would be of a small size. In these circumstances, they would tend to keep out of the scheme under a voluntary plan or feel a sense of unfairness under a compulsory plan.

On the other hand, the question of obtaining appropriate estimate of premium rates is of importance only from the point of view of the cost of the scheme to the insurer and the insured, and under a scheme limited in scope such as the one visualised a rough estimate of the premium may possibly suffice to make a beginning.

4. It will be clear from the foregoing remarks that the following types of data will be required for providing a satisfactory basis for Crop Insurance on the individual farm basis:

(i) Statistics of individual yields per acre relating to a representative sample of key farms in each area on which to base the average yield per acre for the area, and the average crop loss per acre. For each such key farm such statistics should extend over a representative period of years, which may be taken as between 10 and 20 years. In the U.A.S. a beginning was made with individual farm data relating to 5 or 6 years.

(ii) Basis for demarcating homogeneous area in respect of productivity and risk of crop failure. Individual farm data, if available may themselves furnish such a basis, based on soil types, etc. could be visualised.

(iii) Within each such areas statistics on which to base allowance for varying agricultural practices, to which it is proposed to give recognition in the scheme.

(iv) Statistics of the costs of producing various crops in the different areas, separately for different stages of production.

5. On the other hand, if Crop Insurance is based on the condition of a tract, rather than on that of the individual farm, considerable approximations in the several factors involved become feasible. The moral hazard that renders the estimation of average yield of each individual farm a matter of primary importance largely disappears. Secondly, the need for making allowance for various types of soils and agricultural practices also becomes a secondary matter; they need be taken into account only in considering 'local calamities' unless these practices also affect variability of yields and it is inteded to give effect to this by permitting separate premiums rates in respect of different practices. While it may still be necessary to limit benefit according to the stage at which the crop loss occurs in the area, the problem of estimating the costs at various stages will also become much less important. It is also clear that for a contract of this type statistics indicative of the condition of a tract, rather than of individual fields would be more appropriate, if sufficiently reliable.

AGRICULTURAL STATISTICS IN INDIA

6. In evolving a suitable actuarial basis for crop insurance in India, the nature of the existing agricultural statistics and their limitations must be taken into account. A brief survey of such statistics will therefore be apposite here.

(a) THE OFFICIAL STATISTICS

7. The existing official statistics of acreages and yield under different crops, could best be discussed in terms of the components of the formula for the seasonal out-turn for a district, viz. area X normal yield x seasonal factor.

The area statistics for the main crops are known to be determined by a process of plot to plot enumeration with a high degree of accuracy in the temporarily settled areas. In such areas the primary agency for the collection of statistics is the village revenue officer who in the ordinary course of his work, is required to make a detailed inspection of the fields in the village or villages in his charge and record estimates of the acreage

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under each crop grown in each field; the resulting statistics are known to be remarkably accurate, provided supervision of the higher revenue staff is adequate. In permanently settled areas, there is no village revenue establishment corresponding to that in temporarily settled areas, and in these provinces acreage estimates are admittedly defective. In the absence of village revenue establishment reliance had to be placed on the reports received from Circle Offices, District Agricultural Offices and Officers of revenue department such as Khasmahal Tehsildars. During recent years, however, a beginning has already been made towards the creation of a primary reporting agency in the permanently settled provinces, and surveys of acreages by random sampling methods have also been conducted.

The other two factors relate to the average yields in the different areas and the seasonal variations therein. The normal yield should perhaps be interpreted as the average yield of the tract over a sufficiently long series of years, but considerable confusion appears to be there in the actual definitions adopted in practice. The figures of normal yields are based on the results of crop cutting experiments and definite rules have been laid down as to the officers of the revenue, land records and agricultural departments who are to conduct the experiments, their number and the manner of conducting them. The crop to be selected is to be average crop on land of average fertility. The figures are revised every five years. But a considerable subjective element enters into the method of selecting plots, rejecting plots considered unrepresentative, the weight given to the different seasons in forming five yearly averages and lastly in the weight given to the five yearly averages in establishing 'normal yields' for the next quinquennium. It is also believed that in actual practice the prescribed rules for conducting crop cutting experiments are not always followed. Dr. V.G. Panse who recently studied the position of the existing agricultural statistics with a view to suggesting methods of improving them, came to the conclusion that the main defect in the normal yields arose out of the bias or lack of representativeness and not out of the paucity in the number of experiments conducted. He also suggested that the normal yield should be calculated with reference to a longer period such as 10 or 15 years; and that a moving average, e.g. average of the preceding ten years, might be regarded as the normal yield.

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The seasonal factor, which is an estimate of the probable yield in a given year is expressed as a fraction or percentage of the normal yield and is usually stated in annas. The normal yield is equated to 12 annas in Madras, Bombay and Assam; to 16 annas in the U.P. and the Punjab; 13 annas 4 pies in C.P. and Berar. The forecasts of yields are made in two stages; the first is based on the appearance and prospects of the standing crops and the second is made soon after the harvest is over; the first has necessarily to be an eye estimate, but considerable amount of subjective element enters into the traditional method of obtaining the second forecast as well, though crop cutting experiments are used as basis. In all provinces under the temporary settlement the estimate is made for each of the important crops in every village by the village accountant. This takes the form of an anna estimate, expressing the season's crop in terms of the district normal crop. The revenue inspector furnishes an estimate for the whole firka for each crop, based on the figures of the village accountant and his own personal experience. Similarly the tehsildar utilises the village inspector's figures and his own experience in forming taluk estimates and these are combined to form district estimates. In permanently settled areas the taluk annawari estimates are made directly by the subordinate revenue officials.

The seasonal factors so obtained are known to be subject to considerable limitations. The difficulty of suggesting a single figure applicable to a whole area, relating the season's yield of the area to the district normal yield, which will involve giving due weight to the differential effects of the weather on a variety of factors, such as varying soil types, individual skills of cultivator, irrigation, varieties sown, pests etc., must itself be considerable; and the village officer has no special training for the purpose. Further, certain types of bias are known to affect the formulation of such eye estimates. The first has been described as the general pessimism of the reporting officers; it has been suggested that this arises out of a tendency to relate the season's crop to the idea of an optimum crop in the mind of the reporter, rather than to that of a normal crop. The result is underestimation and it is found that a long term average of the estimates of the village accountants in a district yield a figure nearer to 75% than 100% of the district normal. A rough correction has been suggested for this bias and is known as Stuart's correction; this consists in

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modifying each condition factor by the factor - (normal condition factor for the district)/(long term simple average of actual condition factors). This of course assumes that the proportionate error due to this bias in the estimates of the patwari is constant from year to year. It is suggested that different correction factors may be used for different districts and crops. The source of a further bias lies in the fact that remissions and suspensions of land revenue dues in temporarily settled areas are made to depend on the village condition factors. Such relaxations of demand are allowed only when the condition factor falls below a certain figure, and it is suggessted that this may result in some overzealous village accountants pitching their annawari estimates too high. The existence of a tendency among the lower staff to keep reasonably close to the normal and therefore not giving full weight to wide deviations from normal has also been mentioned. Dr. Panse made the suggestion that as a check on his work, the patwari may be asked to record, in addition to a general forecast for his group of villages his estimates for the individual yields of a small specified number of randomly selected fields within his jurisdiction. It is understood that in Madras the actual practice is for the village officer to record condition factors for each field within his jurisdiction. Yet another defect in the procedure for obtaining district condition factors is the lack of a uniform procedure to give due weight to the reports of the primary reporting agency. However, in Madras, a definite procedure is in use. The simple arithmatic average of village condition factors is used to calculate the condition factor for a firka from the village figures, and to use the weighted average in combining the condition factors of firkas into a taluk condition factor.

(b) Yield statistics based on Crop Cutting surveys on random sampling basis.

8. It will be clear from the preceding discussion that a large degree of subjective element enters into the traditional estimates of yield; and while it is felt that the resulting estimates are subject to considerable errors, there seems to be no adequate method of measuring the nature and extent of such errors. During recent years objective procedures based on the principle of random sampling have been utilised for estimation of areas and yields and remarkable success achieved in their practical application. The question of estimating areas arises mainly

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in permanently settled areas and even here the tendency has been to create agencies who could undertake complete enumeration. In their application in the temporarily settled areas, the area figures given by the revenue department are taken to be reliable. In most districts tahsils (and in some districts irrigated and unirrigated areas within each tahsil) are taken as strata. A village is taken as the primary unit of sampling and is selected from the total number of villages from the tahsil by the use of random sampling numbers. Then three or four fields are selected randomly from the fields growing the particular crop in the village and in such field a small plot of a size such as 1/20th acre is located at random. Such procedure ensures freedom from bias and accuracy can be secured to any desired degree. It may be noted that ancillary information on different methods, such as varieties sown, cultural practices, manures, soil classes, etc. is obtained in course of the experiments.

From the point of view of the needs of Crop Insurance problem there are two considerations that limit the utility of the data derived from this source. Firstly, the experiments on random sampling basis have started only during recent years; and in no case more than 6 years data are available; and in case of some provinces and some crops, the data relate to a much smaller period. Secondly, the estimates were planned to give reliable estimates of yield for the whole province with a sampling error of 1 or 2% and therefore year to year comparisons of resulting figures could not be of much value in respect of a unit smaller than a district.

(c) Data from Government Agricultural Farms

9. Data of acreages and yields of considerable reliability in respect of individual farms and extending over a considerable number of years may also be obtained from the Government agricultural farms in the various provinces - such as experimental farms, demonstration farms, farms attached to agricultural schools and colleges, etc. Many of these are located in typical areas and the value of the data should be considerable. In one sense, however, such farms may tend to represent optimum conditions so far as various factors entering agricultural production are concerned and in that sense may not reflect the condition of the particular area; however this consideration may be less relevant in considering seasonal variations from year to year, as distinguished from the level of production. A second consideration is that

the number of such farms from which data extending over a period of years can be obtained is exceedingly limited; and a considerable element of accidental variation may enter into the record of yields. It will be desirable therefore to consider data from such farms over as large a period as possible. It must be remembered that a considerable part of the work of such farms is of an experimental character, and consists in experimenting on differential effects of various varieties, manure treatments etc. in the different localities; such experiments are confined only to a small period of years. While the data derived from these sources may therefore be valuable for giving weight to different factors entering agricultural production such data could not be of much value for comparing seasonal variations in yields.

10. Yet another source of data might be the yields of different plantation crops. This may however be of no immediate use since such crops do not enter the present scheme of insurance.

Adequacy of the existing statistics as a basis for Crop Insurance.

11. The foregoing brief review of the agricultural statistics in India should suffice to indicate how far they could provide a basis for Crop Insurance. As pointed out earlier, it is necessary for purposes of Crop Insurance to estimate (1) the long term average yield in respect of each unit, (2) a measure of the seasonal variability of the yields. The problem, therefore, consits in deciding how far the various types of statistics can provide reliable information to serve as basis for such estimates.

(a) Long term average yield -

For a contract based on the condition of an individual farm it is necessary to have long term average yields of a representative sample of farms in each area. As pointed out elsewhere, even in the U.S.A. it is now the practice to demarcate areas in which to permit a uniform coverage and a uniform premium. It is therefore sufficient to obtain an idea of the average yield in respect of each such ' area'. It is essential however that in damarcating areas an effort must be made, by taking into account various agricultural practices, soil types, etc., to ensure that the yield of individual farm is closely approximated by the average yield of the area; the areas must therefore be

carefully defined. In case of a contract based on the condition of a tract, it will suffice for the workability of the scheme if the yield represents with fair accuracy the average yield of the tract; however in order to make the indemnities conform to the needs of the farmer it will be nevertheless desirable to demarcate tracts such that within such tracts the variations in yields in any season would not be very large. It will be realised therefore that the risks resulting from inadequate data are much less serious in this type of contract.

In India the only long period data of yields of individual farms is that derived from the agricultural stations in the various provinces. While such data are valuable in view of their reliability, they cannot be considered as representative of the conditions on an average cultivator's farm, so far as the level of productivity is concerned.

As pointed out earlier, the normal out-turns in the official statistics relate to a district. The published figures for seasonal factors also relate to a district. However, these are obtained by successively averaging the figures relating to smaller units, the primary unit for which the seasonal factors are available being a village in most ryotwari provinces; it is understood that in Madras seasonal factors are available in respect of each holding. If these figures were reliable it would be possible to obtain normal out-turns for each village or revenue inspector's circle. It will be noted that the seasonal factors relate the condition of the crop in the village to the normal out-turn for the district, after making allowance for the type of the soil in the village. Hence a normal out-turn for each village could be computed. Thus, if the long term average of the seasonal factors is 9 annas, while the district normal out-turn is represented as 12 annas, the normal out-turn for the village would be 9/12 x District normal out-turn. After adjusting for the average soil type in the village, this should give an actual average out-turn for the village. Perhaps a Stuart's Correction if applied to all the seasonal factors would improve the figures so arrived. When the soil annawari is used with this, it should be possible to arrive at a figure of average yield for each class of land. It is doubtful however whether the seasonal factors over a long period are reliable enough for this purpose . Nevertheless, they may provide a starting point. In addition to the estimates so obtained, it would be possible by enquiries to obtain

figures which are believed to represent the long term average yield in each village. It has been pointed out that some such figure must be at the back of one's mind before a seasonal factor for a particular season is estimated. Thus Anderson has pointed out that in valuing a particular crop in a village "it therefore seems essential to good valuation that each officer should first put down what he considers to be the fair normal yield of that crop on land of the best class in that village".

Turning next to the data derived from sample surveys on a random sampling principles, it would be noted that such surveys have started only recently and it is not possible to obtain data from this source for a period longer than 6 years in any case; while in some cases the period is much shorter. It is likely for example, that in some cases a five year period may include an unusually large number of bad seasons. The reliability of this source of data is however admittedly superior to that of the official statistics and it would seem reasonable to form estimates of average yield per acre for districts by utilising the figures in combination with those of the normal out-turns and seasonal factors over a long period, such as fifteen or twenty years. A second point about statistics from this source is that the survey is intended to provide estimates with a sampling error of 1% to 2% for the province in a given season. This may mean estimates for a season with a sampling error of 5% to 10% for a district. It would appear therefore that the extent of sampling is such that over the period for which data are available the estimates of long-term yields per acre for smaller administrative units would contain large sampling errors.

A further point in connection with the data from this source is the value of the ancillary information obtained in connection with such surveys. This relates to type of irrigation, variety, manuring, date of sowing, etc. It is clear that this information should prove useful in making allowance in yields for varying agricultural practices. Information is also collected about soil in broad classification based on type (sandy,loam or clay) and level (high, medium or low-lying). It may be suggested however that a better result may be expected if the yields of the plots used in the survey are related to the land-revenue soil classification which is intended to be more thorough. The results of an investigation carried out on these lines by Dr. V.G. Panse, of the

Institute of Plant Industry, has been given in an appendix to the next chapter. This would indicate the possibility of investigations of this type enabling a broad grading of the soil classes according to the level of productivity in each. It will be remembered that the land revenue, soil annawari or soil factor is itself intended to reflect the level of productivity. The forms used for the crop-cutting survey also include remarks about the extent of the various crop risk factors such as weed infestation, damage by frost, rust, hailstorm, etc., damage by cattle, rats, etc., and abnormal weather conditions.

It will be clear from the preceding discussion that while the data may be considered as not sufficiently reliable for providing yields for individual farms, it may yet serve as a broad basis for assigning figures within a large unit such as a district or taluk to each broad class based on factors like soil-type, variety and other agricultural practices. It will also be clear that in view of the limitations of the data, a type of contract based on a tract would be much safer and reliable . Figures for normal out-turns for taluks may also be available in certain provinces.

(b) Seasonal variability -

It is clear that the 'seasonal factors' which form part of the official statistics would be adequate for representing the seasonal variation in the area to which they relate, if they were sufficiently reliable. Such investigations as have been made however indicate the possibility that the data are seriously defective in this respect. Some figures bearing on this problem which enable comparisons between the estimates of seasonal variability derived from data of yields of agricultural farms and corresponding estimates derived from seasonal factors for the respective areas being made, indicate that the seasonal factors may substantially understate the extent of variation. This will lead to a smaller premium than is really required and would therefore be unsafe. It will be clear however from what has been said above that the published seasonal factors used in such investigations relate to districts. Perhaps it would be useful to obtain estimates of variation from smaller units such as Revenue Inspector's circle, villages or, in Madras, individual holdings. It may be noted however that

the crop cutting surveys have indicated a tendency in the official figures to under-estimate yields during favourable seasons and over-estimate yields during unfavourable seasons. This should lead to underestimation of the true seasonal variation.

The data derived from the random sampling surveys relate to a period of only 6 years. This must be considered as too short for giving a reliable estimate of seasonal variability. Further, owing to the limited extent of the sampling, comparisons could be made only for a large unit such as a taluk as a whole and broad figures arrived at as representing the variation during this period, which would ignore the possibility of differential effects of each season on different units such as villages or fields.

Perhaps, in the circumstances, the most reliable estimates of seasonal variability will be those derived from the data from Government agricultural farms. Yields from permanent plots on such farms are available for a long term of years and inspite of the small number of such farms, the comparatively long period may ensure considerable reliability in the results. Actual investigation of yields of agricultural farms in C.P. and Berar indicate considerable stability in seasonal variations of yields in respect of each crop. This would indicate that inspite of the small number of such farms, this data may provide a fairly reliable basis for premiums. It would also appear possible in view of such stability to provide for a uniform percentage premium for each crop in each centre. This would imply a gret simplification in the scheme. A point to be considered in connection with the use of the data from the agricultural farms as basis for premiums for an average cultivator's farm is whether a larger co-efficient of variability should be expected in case of the latter, in view of the comparatively low yields on average cultivator's farms. A tendency of low yields to be correlated with high risk is indicated by the experience in the U.S.A. The data from the agricultural farms in C.P. and Berar do not however seem to indicate any negative correlation between yield and coefficient of variability. Nevertheless it would be safer to assume that in view of the greater care and more plentiful resources with which cultivation is done seasonally at Government farms the crops may be less exposed to some of the adverse seasonal factors and hence and as a general measure of safety, the coefficients of variability may be suitably

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increased in accepting this as basis for premium on an average cultivator's farm. Another similar problem would be whether to assume different coefficients of variability in respect of different soil classes. It may be suggested that this may be ignored for the present and this point taken into account in collecting data in course of the operation of the scheme for future use.

Procedure for determining premiums and insurance coverages -

12. The following procedure may therefore be adopted in determining premiums and insurance coverages:

1) Varying average yields may be obtained for each broad class of holding. This may be done by starting with an average yield for a taluk, and adjusting this for soil factor, availability and type of irrigation facilities, variety, etc.

2) Premium rates may be based on coefficients of seasonal variability derived from agricultural farms and suitably adjusted. These may be combined with the appropriate 'area' average to derive the actual premiums.

3) If it is desired to make a rough allowance for the possible correlation between low yields and high risk, the same premium per acre may be allowed for different farms in a tract, in spite of the larger insurance coverage permitted to the high yield farms. A similar procedure has been current in the U.S.A. and should encourage insurance of better farms.

It will be noticed that premium rates are derived on the basis of individual farms and as such should be appropriate for a type of insurance contract based on the condition of individual farms. It is suggested however that the same premium may also be used in connection with insurance based on the condition of a tract.

Subsidiary data necessary for crop insurance

13. In addition to the investigation into condition factors, etc., to secure suitable insurance coverages and premium rates, it will also be necessary to collect data as to the costs of production in the various areas, the current agricultural practices and allowances in yields to be made for the main variations in them, time table of the various operations in the history of different crops, etc. It may also be necessary to collect data about the incidence and extent of 'local calamities'.

It is clear that for this purpose detailed local studies in the areas where the crop insurance is to be undertaken will be necessary; for this purpose actual surveys of the areas as well as utilization of such literature as may be available will be essential. A great deal of work has been done in collecting data on costs of production in the different provinces. As regards Madras, e.g., the following sources of such data have been suggested:

(i) Original settlement reports:

(ii) Recalculation in a few of the resettlement reports;

(iii) Investigations by the students of Madras University of select villages;

(iv) Detailed monograph by the Indian Council of Agricultural Research for sugarcane and cotton areas in the province;

(v) Figures collected by the Government agricultural farms;

(vi) Figures collected by the Registrar of Co-operative Societies and Director of Agriculture of various districts.

(vii) A recent report by the Board of Revenue on the cost of cultivation.

Data from agricultural farms and ancillary information collected in course of the crop cutting experiments on a random sampling basis have already been mentioned as sources of information on other topics.

Collection of Data during the Pilot Scheme Stage.

14. It is clear that one of the functions of the crop insurance agencies in the different areas during the experimental period will be to collect the necessary data for putting the coverages and premiums in the area of the operation of the scheme on a more satisfactory basis. It seems unlikely that during the early years the degree of participation in the scheme would be adequate enough to ensure that the record of yields of the insured farms will be adequate for the purpose. Arrangements will therefore have to be made to collect data in respect of a random sample of key farms in each village or group of villages considered to be fairly homogenous for the purpose. With a view to extending the scope of insurance to other similar areas such data may also be collected in selected villages in neighbouring areas within the same region where the scheme may not operate in the first instance. It has

been already pointed out that, Dr. Panse suggested that as a means of improving the present methods of estimating seasonal condition of crops, "the patwari may be asked to record, in addition to a general forecast for his group of villages, his estimates for the individual yields of a small specified number of randomly selected fields within his jurisdiction". He also suggested that the estimates of yield may be made directly in terms of maunds and acres, instead of in the present annawari notation which brings the normal factor.

In case of a contract based on the condition of an area it will be necessary as a part of the normal working of the scheme to determine the average crop condition of every area during every season. A crop cutting survey on the random sampling principles has been suggested as a suitable method of doing so. It is clear that such a survey will refer to the entire area of the operation of the scheme rather than the insured farms only. The necessary information for strengthening the statistical basis of the scheme could be easily collected in course of such surveys. In particular it has been suggested that together with crop cutting independent eye estimates of the yields of the fields sampled may also be obtained just prior to harvesting. This will enable a study of the accuracy attainable by eye-estimation. In course of time, this may render possible a reduction in the extent of sample harvesting by the use of a double sampling procedure; under such a procedure a large number of fields could be eye-estimated just prior to harvest and a fraction of these fields actually sample harvested in order to establish the regression of actual yield on eye-estimates. It is clear that such a procedure will be of value even where the indemnity is payable on the basis of the condition of the individual farm, since it may provide a basis for adjusting the eye estimates of yields of individual farms.

Chapter VII.

A SCHEME OF CROP INSURANCE FOR C.P. AND BERAR.

1. In this chapter an attempt is made to apply the principles and methods outlined in the preceding chapters to C.P. and Berar so as to obtain a concrete picture of the actual working of the scheme. With a view to making the picture complete and self-contained certain principles discussed earlier in appropirate places have been restated in relation to the conditions in C.P. and Berar; it is believed that this would be of some value inspite of it being merely a repetition in some parts.

It may be worth while referring here to one feature of the estimates given below. It sill be noticed that the insurance coverages and premiums have been calculated in terms of the respective commodities in the first instance. However,to enable easy comparisons, these have also been expressed in terms of their cash equivalents at assumed prices. These are,however,intended to be purely illustrative and the essential features of the scheme should be visualised in terms of the commodity figures. The actual prices assumed were the median harvest for C.P. and Berar for 1946-47 and the average of the harvest prices for wheat and rice during the period 1942-43 to 1945-46. It will be noted that the appropriate prices would really be those expected during the quinquennium in which the scheme is to operate and there would appear to be no particular advantage in adopting the latest figures for the prices.

PREMIUM BASES FOR CROP INSURANCE.

2. Three sources of data are available in India for an investigation on these lines:

(a)Seasonal factors and official yield estimates for various crops,seasons and areas.

(b)Data from the crop cutting experiment on a random sampling basis.

(c)Data of yields from agricultural farms.

The main consideration that will limit the usefulness of the data derived from crop cutting experiments on a random sampling basis is the comparatively short period for which such data are available. This period must be considered as far too short for use for obtaining an adequate estimate of seasonal variability.

On the other hand, the data from official crop forecasts are available for a large number of years but their reliability is open to serious doubt and no basis is available to judge the extent of the error

involved. In any case the published data refer to the average condition of a whole district in respect of a given crop and such investigations as have been made appear to indicate that they might tend to under-estimate seasonal variability to a considerable extent. It may be worthwhile studying the variations in the estimates relating to smaller areas such as villages or individual farms when these happen to be the primary units in respect of which forecasts are made.

The data from agricultural farms may be expected to be comparatively much more reliable. However, it is wellknown that these farms represent conditions of production much more efficient than those possible on an average cultivator's farm. The result is that the average level of production on these farms is incomparably higher. It may also be expected that the seasonal variation of yields on such farms will be smaller than that of the yield of an average cultivator's farms, since it may be expected that on the agricultural farm there will be available knowledge and means to minimise the effect on the crops of average seasonal factors much superior to those within the reach of the average cultivators.

In table V comparable estimates of seasonal variability derived from the official seasonal factors and from the agricultural farm data are brought together. These are taken from papers contributed by Dr.R.J.Kalamkar and his colleagues in the Agricultural Metereology Branch of the Indian Metereological Department. A similar comparison in respect of C.P. and Berar is presented in Table VIII.

3. The average yields and the coefficients of seasonal variability for the agricultural farms in C.P. and Berar have been given in tables III (Cotton), IV(Wheat) and V(Rice). It would be noticed that these tables indicate the existence of a fairly stable seasonal variability in the respective regions of concentration of each commodity. It would, therefore, appear possible to proceed on the assumption of a uniform coefficient of variability for each crop; this, with the additional assumption of a normal distribution of seasonal deviations from the average yield, will provide a method for the calculation of a uniform premium rate as a percentage of the average yield for each farm. This may then be combined with an appropriate estimate of the average yield suitable for the insured farm.

It is suggested that the estimate of coefficient variability appropriate to an average cultivators holding may be based on the

results obtained from the data of agricultural farms relating to the different crops with a suitable adjustment to allow for the additional variability that may be expected under the less efficient conditions of production on an average cultivator's holding . On the other hand,the average yields per acre of the agricultural farms would be incomparably higher and it is suggested that the estimates of average yields may be derived from the figures of the district average yields given in the official agricultural statistics and those based on the data obtained from crop cutting experiments on a random sampling basis.

4. To bring the average yields nearer to those obtained on an actual holding,allowance may further be made for the class of the soil.

It is suggested that for this purpose the soil classification on which the Land Revenue Settlements are based may provide a suitable basis. The revenue soil classification is itself intended to reflect primarily the relative net productivity,i.e., gross yield per acre with a deduction in terms of produce for the cost of production of the different types and grades of soil. The following brief description of the classification used in the revision of the Land Revenue Settlement of the Saugor District in C.P. during 1911-16, may serve to illustrate the nature of this classification. Under this soil factors are assigned to each class of soil. "The foundations of the Central Provinces soil unit system are firstly an accurate and uniform soil classification and secondly the scale of factors which correctly represent the comparative values of the different soils and positions. The tests applied were,firstly crop experiments; secondly the pitch of new rents; and thirdly,the opinions of representative landlords and tenants. The cardinal factor was 32 for an acre of Mund I,the typical wheat soil and other factors ranged from this,expressing in arithmetical proportion the comparative superiority of each position". Each primary soil type is cross-classified on a twofold basis,viz.positions and zones. The position classes are,ordinary (gently undulating),sharply sloping or damaged by scour; irrigated,embanked,double cropped,lowlying and improved by silt. The zones separate areas manured by village drainage.those near to village site and those damaged by wild animals. Suitable additions to or deductions from the basic soil factors are made to allow for these cross-classifications.

It must be remembered that cropping is itself a selective factor in a sense; e.g., in the wheat regions in C.P. no reasonable cultivator would ordinarily attempt to grow wheat on inferior types of soil. It was pointed out, for example, that of the 13 soil classes in ordinary position used as bases of settlement in Saugor District, only the six superior ones need be considered in respect of the cultivation of wheat. This fact should limit the variation of yields on account of the soil variations in a given area.

It may be expected that the soil factors may themselves broadly reflect the relative productivity of the different soil classes. It is suggested, however, that a comparatively more reliable measure of the differential productivity of the various soil classes may be obtained from the the results of the crop cutting experiments on a random sampling basis when these are analysed in relation to the soil classes to which the different experimental plots belong. An investigation on these lines in respect of cotton in the Central Provinces was carried out by Dr.V.G. Panse and the results of this are summarised in table VI. The regularity of the results would indicate that this line of approach may be pursued with success in case of other crops and areas.

ESTIMATES OF PREMIA AND INSURANCE COVERAGE FOR C.P. AND BERAR.

5. The following basis for permia appropriate to the different crops in C.P. and Berar are therefore only intended to supply broad preliminary estimates:

(a) Cotton. Seasonal Variability- It may be noticed from table III that in the cotton tract of C.P. and Berar the coefficient of seasonal variability for cotton representative of the conditions on the agricultural farms in those districts may be taken as 35%. The appropriate premium for insuring agricultural farms, as shown in table I, would therefore be 3.25% of the average yield. The average of the premiums obtained on the U.S.A. basis would be 3.03%. It is suggested that the average coefficient of seasonal variability representative of the conditions on an average agriculturist's holding may be taken as 40%; this should mean a premium rate of 4.32% as shown in table I.

Average Productivity. The figure for the provincial average yield per acre for the period 1936-37 to 1945-46 viz. 225 lbs. may be taken as representative of the productivity on an average agriculturist's holding.

(b)Wheat - Seasonal Variability- It will be seen from table IV that in the wheat region of C.P. and Berar the coefficient of seasonal variability for wheat representative of the conditions on the agricultural farms may be taken as 30%. This would imply a premium of 2.24% of the average yield as shown in table I. The average of the premiums for individual farms obtained on the U.S.A. basis is 2.80 . The coefficient of seasonal variability appropriate to conditions on an average cultivator's holding may be taken as 35%. This gives a premium of 3.25% of the average yield.

Average Productivity - The figure of the provincial average yield per acre during the period 1936-37 to 1945-46 viz.399 lbs. may be considered to represent the average level of productivity.

In C.P. the irrigated area under wheat represents a very small proportion of the total area. In 1946-47, in Jubbulpore Division, only 5,600 acres out of 860,000 acres were irrigated, i.e. the irrigated area was less than 1% of the total acreage. The yields per acre in irrigated and unirrigated areas may be taken to be roughly 1,000 lbs. and 600 lbs. respectively.

(c) Rice - Seasonal Variability - In the rice region of C.P. and Berar, the coefficient of variability for rice appropriate to the conditions on the agricultural farms may be taken as nearly 23%, as shown in table V. The premium corresponding to a coefficient of variability of 25% is 1.39% of the average yield. The average of the premiums for individual farms calculated on the U.S.A. basis work out to be 1.12%. If the variability appropriate to the cultivator's holding is represented by a coefficient of 30%, 2.24% would be a suitable premium rate.

Average Productivity - The provincial average yield per acre for paddy during the period 1936-37 to 1945-46 was 592 lbs. In C.P. and Berar a considerable proprotion of area under rice is irrigated and, as is well known, the yields per acre in irrigated areas are considerably higher. The following tabular statement should give an indication of the position in this respect.

P A D D Y.

	Transplanted		Broadcast		Total.	
	Irri-gated.	Unirri-gated.	Irri-gated.	Unirri-gated.	Irri-gated	Unirri gated.
YIELDS. (Normal outturns during quinquennium ending 1936-37) --						
Raipur and Bilaspur.	900 lbs.	620 lbs.	868 lbs.	620 lbs.	-	-
Drug.	990 "	620 "	930 "	620 "	-	-
ACREAGE (thousand (1946-47 acres).						
C.P. & Berar.	436	380	741	3217	1177	3597

It will be seen that nearly 25% of the acreage under rice is irrigated.

On reference to table III,IV and V, it will be seen that if the agricultural farms had been insured during the periods indicated an indemnity would have been payable,on an average,once in 4 years for cotton, once in 5/6 years for wheat,but only once in 9 years for paddy.These facts would appear to indicate that the need for insurance protection is much less urgent in the case of rice in C.P. and Berar than in the case of the other two crops. It may be expected therefore that insurance of rice on a voluntary basis may not prove to be very popular inspite of the comparatively low premium rate.

In the following table the foregoing discussion is summarised,and the value of the premia and the average yields are also shown at suitable current prices.

	Assumed average yield per acre		Percentage of the average.	Premium.		Assumed price.
Commodity	Quantity.	Value		Quantity. lbs.	Value. Rs.	
Cotton.	225	51-11	4.32%	9.7	2.4	Rs. 180 per khandi.
Wheat.	400	53-7	3.25%	13.0	1-12	Rs.11 per maund.
Rice.	600	72-0	2.24%	13.4	1-5	Rs.9-14 per maund.

DESCRIPTION OF THE CROP INSURANCE CONTRACT.

6. The following description of the crop insurance contract for different commodities should help in seeing the different features of the contract as emerging out of foregoing discussion in relation to one another. A 16 annas crop is assumed to be normal for each commodity. The indemnity in any season is equal to two thirds of the deficiency of the actual yield of the season from 75% of the average yield.

Cotton -No indmnity will be payable in case the condition of the crop is 12 annas or larger. In case the condition in any season falls short of 12 annas,an indemnity equal to 9 2/3 lbs. (Rs.2/2/-) per acre for each one anna by which the crop falls short of 12 annas will be payable. The maximum indemnity payable under the contract in case of ancomplete crop failure would therefore be Rs.25/8/- per acre.

Premium per acre 9.7 lbs.(Rs.2-4-0).

Wheat.- No indemnity will be payable in case the crop is 12 annas or larger. In case the condition in any season falls short of 12 annas an indemnity of 16 2/3 lbs.(Rs.2/4/-) per acre for each one anna by which the condition falls short of 12 annas will be paid. The maximum indemnity will Rs.27/-.

Premium per acre 13 lbs.(Rs.1-12-0).

Rice - No indemnity will be payable in case the crop is 12 annas or larger. In case the condition in any season falls short of 12 annas an indemnity of 25 lbs. of rice (Rs.3/-) per acre for each one anna by which the condition falls short of 12 annas will be paid. The maximum indemnity will be Rs.36/- per acre.

Premium per acre 13.4 lbs.(Rs.1/5/-0).

SELECTION OF AREAS IN C.P. & BERAR.

7. In Table VII is presented information that might help in the selection of suitable areas for the operation of the pilot scheme. In C.P. and Berar there are well marked regions in which the production of cotton, wheat and rice is concentrated, and it has been suggested that suitable areas for insuring each crop may be selected from the respective regions. In the case of a voluntary scheme, the actual extent of the selected area will depend on the degree of participation that could be secured and this must be a matter for conjecture. Assuming, however, that it would be possible to start with an average participation of 5% of the cultivator's holdings, and that this would be improved thereafter by the entry of an additional 1% of farms in each successive year during the period of operation of the scheme, an average particpation of 7% of the cultivated holdings might be expected during such period. It has been estimated that the size of an average cultivator's holding in C.P. and Berar may be taken as 12 acres, and it may be assumed that there will be roughly 6,000 such holdings in a Revenue Inspector's Circle. It may be expected therefore that there may be on an average about 400 insured holdings in each circle. On these assumptions the following selection of areas for the operation of the scheme in C.P. and Berar would appear to be suitable:

Cotton - 2 Contiguous Revenue Inspector's Circles in each of the four Berar Districts, Akola, Buldana, Amraoti and Yeotmal.

Wheat - 2 contiguous Revenue Inspector's Circles in each of Saugor and Hoshangabad districts.

It has been suggested that the actual selection may be effected in consultation with the officials of the Provincial Governments so as to ensure that a beginning is made in conditions where there is the greatest possibility of success of the scheme. It may be however pointed out that the selection of the circle in which the agricultural farms are situated will appear to have substantial advantages from this point of view. These

farms are normally located in typical areas and the experience gained in course of their working would be of immense value in the actual administration of Crop Insurance. The number and neames of farms in the various districts have been shown in table VI.

EXTENT OF OPERATIONS OF THE SCHEME.

8. It may be useful at this stage to obtain an idea of the extent of the operations of the scheme,on the basis specified above. It would be reasonable to assume that tne better class of farmer will be attracted to the scheme during the early years and that the average size of the insured holding will be larger than that of the average cultivator's holding; on the other hand only a fraction of the area in an insured holding will be under the insured crop. Taking these considerations into account,the average insured acreage may be taken as 9 acres per holding. The following tabular statement would then summarise the extent of crop Insurance Operations in C.P. and Berar during the pilot scheme stage.

Commodity.	No. of Revenue Inspector's Circles.	No.of Insurance contracts.	Acreage covered by insurance.	Annual permium in come. Commodity Value. Rs.
Cotton	8	3,360	30,240	375 kds. 67480
Wheat.	4	1,680	15,120	2390 mds. 26280
Total.	12	4,040	45,360	Rs.93,760

9. It has been suggested that in view of the limited scope of operations visualised during the experimental stage of Crop Insurance,it will not be necessary to insist on setting yp the full machinery of commodity storage reserves; but that the premiums may be received and the indemnities paid out in terms of the cash requirements at current prices at the time of the payment; this would mean that in certain cases it may happen that in certain events,depending on the variations in prices and the time and extent of crop losses Government,may have to bear an additional liability on account of adverse variations in prices. The figures for the premiums income obtained above,may serve to appreciate the maximum extent of possible liability involved in the suggested procedure. It is,of course, clear that the maximum accumulation of reserves cannot exceed five time the annual income shown in the above statement; and this maximum figure will be reached only in the improbable event of no indemnity being paid in respect of any contract during the period.

10. During the period of 1943-44 to 1945-46,the average area under cotton in C.P. and Berar was 3.0 million acres and the average acreage under wheat was 2.7 million acres. If this entire acreage were to be insured under a compulsory

scheme, the total premium income on the basis mentioned above, would be nearly Rs.67 lakhs and 48 lakhs. In terms of quantities of the commodities, the figure would be nearly 37,000 khandis of kapas and 429,000 maunds or 15,750 tons of wheat.

GOVERNMENT SUBSIDY TO THE SCHEME.

11. A second problem that may be usefully discussed at this stages is the problem of subsidising the scheme. It has been assumed in the foregoing calculations of premium rates that the costs of administrations will be met entirely by the state,as is done even in the U.S.A. the problem considered below therefore is whether in addition to this,an additional subsidy should be given with a view to bringing insurance within the means of an average cultivator and making it attratice from his point of view.

It will be remembered that the premiums suggested for C.P. are in each case less than 4½% of the average yield and that even at the present high level of prices they are comparable to the land revenue demand. In 1937-38 the average incidence of land revenue per cultivated acre in fully assussed ryotwari areas in Akola and Amraoti was Rs.1/14/-. A further point that must be remembered in this connection is that cheaper contracts with varying benefits will also be provided. There are two different ways of limiting the benefits with a view to reducing the size of the premium. Firt,while making the indemnities payable in the event of the condition of the insured crop falling below 75% of the average yield,the maximum sum assured under the contract may be made smaller,e.g. only 25% of the average yield; this will reduce the premiums payable to half the figures shown in the table. I. As an alternative, an indemnity may be made payable only in the event of the condition of the crop falling below 50%, and a maximum sum assured of 33⅓% or lower permitted under the contract. The result of this will be that the indemnities will be payable much more rarely but for a given premum they would be larger than under the earlier form of contract. This elasticity in the from of contract shifts the main emphasis in the discussion of the size of the premiums,from whether the cultivator could afford to pay the necessary premiums.to whether he will consider the premiums too heavy in relation to the benefits which they bring.

12. The question of the ability of the cultivator to pay premiums can only be discussed in a broad manner. For this purpose the average size of the premiums may be considered in relation to the average cost of production per acre and the average income from crop yields per acre. Estimates of living costs per family are not available. The investigation into the cost of production of crops carried out by the I.C.A.R. during 1933-36 in the principal sugarcane and cotton areas brought out the following results in regard to C.P.

Average cost of production per acre in C.P. & Berar.
(Average 1933-34 to 1935-36).

Region.	Cotton.		Wheat.	
Nagpur Wardha	Rs.12.68	± 0.45	Rs.20.70	± 0.77
Berar Plains	" 20.67	± 0.80	" 24.89	± 1.34
Berar Ghats.	" 16.85	± 0.72	" 21.56	± 0.91

In arriving at these figures, in order to ensure comparability between different holdings, every cultivator was debited with the cost of labour of himself and his family and the rented value for his own land and interest on capital. In the Berar Plains, the human labour item represented 27% of the total cost, while the rental value represented 18½% of the total cost Rent and land revenue formed another 14.6% . It is clear however that the actual figures obtained above must be considered as out of date in terms of present costs and prices. Estimates prepared in the Directorate of Economics and Statistics, obtained by making suitable percentage adjustments in the various items in the I.C.A.R. accounts, indicate that a more uptodate figure for the cost of production of cotton in C.P. and Berar may be taken as Rs.36/- per acre. Allowing for the rental value and assuming that half the human labour is contributed by the family, perhaps the actual cost of production in repsect of an owned holding might come out to be nearly Rs.26/-, which is nearly half the average income per acre at present prices. In a year when the yield is 75% of the average, at the assumed price, the yield would be Rs.39 per acre.

It is not possible to relate the total family income to the living expenses of the family, but it would appear that under the present conditions the premiums suggested need not prove too heavy. And in the individual cases when they are found to be not within the means of the farmer he can always go in for a contract with more limited benefits.

13. It is essential however to emphasise the nature of crop insurance premium as a cost item in the farm accounts. It is important to remember that, under a scheme under which the expenses of management of the crop insurance programme are not borne by the insured, this item, if price variations be ignored, should have no effect on the average net income over a series of years. The value of net income in any season will depend on the level of yields obtained during the season and the price. To consider the average net income of a farmer it will therefore be necessary to consider the average yield obtained by the cultivator over a number of seasons. Crop insurance merely results in introducing a constant cost item in good years, which is compensated by an addition to the average income during the bad years. As pointed out elsewhere, the question of the ability of the farmer to pay premiums is largely

a question of choice between different ways of meeting the impact of bad seasons. It may be done by saving against it in advance individually or collectively, or by incurring loans after the event and paying for them subsequently at a much larger cost owing to interest charges. It is essential to emphasise this aspect of the problem, and to differentiate the nature of crop insurance premium from that of items like rent or land revenue. To a large extent, therefore, the question of attracting the cultivator into the scheme is a psychological and educative one of pointing out to him the wisdom of timely thrift.

14. It has been suggested that insurance may be offered at such rates that it should be clear to every cultivator what he is losing by keeping out of the scheme. Perhaps to make this fact really obvious to the uneducated farmer in India, the premiums will have to be purely nominal and a major proportion borne by Government. This is of course intended to be a temporary measure to remain in force only during the experimental stage of the scheme, so as to give the farmer an inducement to enter the scheme and see for himself the benefits it brings. It must be remembered however that in the event of a substantial participation in the scheme, the cost of the resulting subsidy may be very heavy. It has been pointed that the average premium for the scheme is Rs.2-1-0 which is of a size comparable to the land revenue demand.

Another important consideration against a subsidy of this kind is that once given it may be difficult to withdraw when the scheme is extended. It may be difficult to persuade the farmer to pay a much heavier premium for the same benefits after he is accustomed to pay at nominal rates.

If, however, it is decided that a subsidy should be given with a view to reducing the size of the premium, an alternative basis may be suggested on which the size of the subsidy in case of a contract based on the condition of individual farms may be determined. As pointed out earlier, the premiums suggested have been based on the assumption that the seasonal variability of yields on an average agriculturist's farm will be larger than that experienced on agricultural farms in the respective region. It may be expected however that some of the insured farmers will be more efficient than others and it would be expected that the best class of farmer would experience a seasonal variability comparable to that experienced by the agricultural farms; the premiums that he should have paid on the basis of his individual experience would therefore be lower than those suggested. There would appear to be therefore in the suggested basis an element of pooling of risks which is no doubt quite legitimate in a scheme of this nature. However, the size of the subsidy could be determined so as to reduce

the extent to which the better class of farmer subsidises the less efficient class. This would ensure that on an average over a term of years, even the best class of farmers would receive by way of indemnity nearly the equivalent of what he is paying by way of premium. As the general efficiency of agricultural practices improves in course of time, and it may be hoped that the present slow pace may be accelerated in the new political context, the class of efficient farms will progressively widen and the government subsidy will be rendered unnecessary. If an approach to the question of subsidising the scheme is made along these lines, the size of the necessary subsidy may be decided as follows:

As pointed out earlier, the appropriate premium for insuring cotton acreage on agricultural farms would be 3.25% of the average yield, while the premium actually assumed is 4.32% of the average yield. The difference between this viz. 1.07 represents a fraction of nearly 25% of the actual premiums. The corresponding fractions of the actual premiums in respect of wheat is nearly 31%. But it may be suggested that in view of the much smaller size of the premiums for wheat, a uniform subsidy of 25% may be treated as the maximum subsidy that would be suitable in C.P. and Berar. The annual value of the premium as estimated above is nearly Rs.94,000. The cost of a subsidy of this extent should therefore be Rs.23,500/-.

15. It has been suggested that as inducements to insure, government may provide free plant protection services in the areas of operation of the scheme, and sell pure seed, fertiliser, agricultural implements, etc. at concession rates to the insured. While recognising the desirability of such measures, and their appropriateness in relation to crop insurance in the sense that they will result in reducing the cost of offering insurance protection by increasing the efficiency of agriculture, it may be doubted whether they would be very effective in attracting cultivators into the scheme, especially as they might be perhaps also available in connection with other programmes of agricultural development.

MACHINERY OF CROP LOSS ADJUSTMENT.

16. It has been suggested that a scheme of crop insurance under which the main benefits are paid on the basis of the condition of a tract in the event of 'general calamities' will contribute to the simplicity and safety of the scheme, which is very desirable under Indian conditions. The broad outlines of a machinery for the crop loss adjustment under this form of contract has also been suggested. It may be helpful at this stage to present a more concrete picture of the working of this aspect of the scheme with reference to the proposed plan for C.P. and Berar.

In the foregoing paragraphs six centres each consisting of two contiguous Revenue Inspectors' Circles have been suggested as a suitable area for operation of

the scheme. By selecting comparatively homogenous centres,in relation to type of soil as well as various agricultural practices,it may be possible to ensure that each such centre can be considered as a single tract for purposes of ascertaining crop losses in case of general calamities. In exceptional-seasons it may be necessary to separate each tract into more than one area,but this could be easily ascertained on the basis of the preliminary survey of crop conditions,and also the actual crop-cutting survey suggested below.It may also be remarked that during years in which it is obvious that no indemnity will be payable,an estimate of crop condition will not be necessary for the working of the scheme; in any case estimates of much lower precision will suffice. However,since on of the objectives of the pilot scheme is to provide a more adequate statistical basis for crop insurance it may be suggested that sampling on the full scale may be undertake in every season during the pilot scheme stage.

17. It is suggested that crop cutting surveys on a random sampling basis may be undertaken with a view to obtaining estimates of yield of a specified degree of precision in respect of each centre. In course of such surveys ancillary information on a variety of factors which affect yields,risk of crop loss,costs etc. could be obtained so as to serve the purpose of refining the statistical basis of the scheme. In particular,it will be useful to obtain at the same time two or three independent eye estimates of the yield on the basis of the standing crop in respect of each harvested plot in order to study the accuracy obtainable by eye estimation..At the same time it may also be useful to obtain eye estimates of a larger permanent sample of fields in each village,the same fields being used from year to year except of course the years when the insured crop is not grown on them.

It has been pointed out that since it may suffice to express the indemnity in terms of annawari estimates of the condition,the survey may aim at estimeting the correct annawari with a reasonable degree of assurance.When the normal crop is 13 annas a degree of precision indicated by a sampling error of 2% to 3% may suffice for this purpose. A broad idea of the extent of sampling necessary for this purpose may be obtained from the results of crop cutting surveys carried out in the province. It may be pointed out that the technique of stratified random sampling is used in such surveys. The tahsils form relatively homogeneous and compact subdivisions of the tract to be surveyed and villages and fields provide the principal and secondary sampling units. It will be also useful to remember that the geographical area of a revenue district is usually about 3,000 sq.miles. A district is divided into four or five tahsils or talugs and a tahsil is further divided into three to five circles. In Berar,a

Revenue Inspector's Circle contains roughly 75 villages while in the Jubbulpore Division the number of villages in a Revenue Inspector's Circle is nearly 135.

18. The following table showing the number of villages required to be selected for obtaining yield estimates of the specified degree of precision have been obtained from the crop cutting survey on different crops carried out in C.P. and Berar. In arriving at the figures allowance has been made for the fact that the sampling is proposed to be done out of a limited total number of villages in each case.

COTTON in Berar (Based on results of crop cutting survey during 1942-43).
Number of villages required to be selected:

No. of fields per village.	Sampling error.		
	2%	3%	5%
3	240	152	70
4	200	127	59
5	176	112	52

WHEAT - (District Saugor)(Based on results of crop cutting survey during 1945-46).

Number of villages required to be selected:

No. of fields per village.	Sampling error.		
	2%	3%	5%
3	198	106	42
4	169	90	36
5	151	81	32

These figures are intended to provide no more than rough indications of the necessary amount of sampling. A better idea would of course be obtained by utilising the data relating to all the seasons for which such surveys have been carried out.

On the basis of the above figures it will be seen that in order to get an estimate of yield of cotton with a 3% sampling error applicable to Berar it would be necessary to select 150 villages and 3 fields in each village. It will be remembered however that we need an estimate applicable to an area equal to two revenue circles which will certainly be very much more homogeneous. It may be expected therefore that an estimate with a sampling error of 2% to 3% will be possible by sampling four fields in each village in each centre which will include nearly 150 villages.

In case of wheat, each centre will comprise of nearly 250 villages and it may be possible to obtain estimates of required degree of precision by sampling three or four fields in half the number of villages. The total extent of experimentation necessary will therefore be spread over 850 villages; for uniformity it may be decided to take four fields in every village, so that the total number of experiments will be 3,400.

19. Next,it may be useful to suggest a suitable machinery for carrying out the work and provide an estimate of costs.

It will be noticed that the maximum extent of experimentation in a village is confined to four experiments in each village. It is quite possible to entrust the entire work to the village patwaris. In fact,this work could well replace the work that is supposed to be done in connection with crop estimation for purposes of revenue remissions and suspensions. However,it is essential that the reliability of the crop estimation for the purposes of loss adjustment should be beyond doubt. In view of this it will be very desirable to provide for very adequate supervision of the work of patwaris especially during the early stages of the scheme. It is suggested that in order to ensure this,it will be desirable to appoint fulltime supervisors on a temporary basis for the period of the harvesting season. It may suffice to appoint one supervisor in respect of every 25 sampled villages enjoining on him that he personnally conducts 80% of the experiments. This would mean that there would be six supervisors in each centre. One difficulty that might arise in this connection is the method of recruitment of the temporary staff. Perhaps it may be difficult to obtain the services of agricultural assistants or Revenue Inspectors during the harvesting season. It may be suggested that it may be possible to utilise for this purpose the kind offices of popular bodies like the Nyaya Panchayats or Janapadas which are functioning in the province. These may be expected to recommend the services of an experienced agriculturist of character and standing for the work of crop supervision. Each such person may be paid an honorarium of Rs.200/- for his work during the period. These supervisors may be given training for a short period in the nature of their duties before they begin the work. It may be pointed out that association of local persons of good standing in the work of loss adjustment will also be very desirable on general grounds. It will be an assurance to the cultivator that the machinery functions without any bias against him and is completely above board. The services of such popular representatives could also be utilised for popularising the scheme. As a secondary check the Revenue Inspector may also donduct five experiments which might replace the experiments he is supposed to conduct at present.

In addition to this,provision will have to be made for labour charges which may be taken as Rs.2/- per experiment.

A further non-recurring item of expenditure will be the cost of the necessary equipment,such as a balance a cross staff,a set of weights,tape,bamboo and gunny bags which will have to be provided to those who are to conduct the experiment. The cost of one such set would

be nearly Rs.75/-. The most satisfactory arrangement would be to supply one set to each patwari. The cost of this would,however,be heavy. An alternative may be to supply each Crop Cutting Supervisor with one set and one set in respect of three villages not covered by the supervisors. This would mean 64 sets in the province,costing a sum of Rs.4,800/-. It will be noted that the equipment utilised during the Cotton harvesting season would be available for use during the wheat harvesting season.

The total expenses in connection with this work will therefore be as follows:-

Recurring expenditure:

Honorarium to 36 crop supervisors at the rate of Rs.200/-	..	Rs.7,200/-
Labour charges at the rate of Rs.2 per experiment.		" 6,800/-
Total.		Rs.14,000/-

Non-recurring expenditure:

Supply of equipment - 64 sets at Rs.75 per set.	..	Rs. 4,800/-

NATURE AND COST OF THE STAFF FOR ADMINISTERING THE SCHEME IN C.P. & BERAR.

20. It has been suggested that a crop Insurance Officer may be entrusted with responsibility for the operation of the scheme in the province. The extent to which the help of the Revenue field agencies could be utilised has also been indicated. The Patwari may be entrusted with a large portion of the field work in the village or villages within his jurisdiction. The help of the Revenue Inspector may also be obtained in connection with the work of crop loss adjustment. In addition to these,the necessary staff will consist of persons necessary to assist the Crop Insurance Officer in his work. It is suggested that for this purpose Crop Insurance Assistants may be appointed,one in respect of each centre in which the scheme is to operate. Their work will be that of organising the selling of insurance and publicity in the respective centres and planning the work in connection with loss adjustment; in addition they will have to perform clerical duties of keeping records,writing policies,receiving premiums,processing claims,etc.,in which they will be assisted by the patwaris. It will be remembered that it has been visualised that there would be nearly 850 policies in each centre. Each Crop Insurance Assistant may be given the help of a peon and stationed in the respective centre,at least during certain parts of the year, such as the harvesting season. The work of such assistants will tend to be concentrated within certain parts of the year. In view of this it would be possible to provide that out of the four Crop Insurance Assistants who may be in charge of the four centres for Cotton during the Kharif season it may be possible to secure the services of two Assistants for work in connection with wheat during

the rabi season. Perhaps it may be felt, however, that in view of the considerable organising work necessary during the pilot scheme stage it would be advisable to provide one Crop Insurance Assistant in respect of each centre.

It will be desirable at this stage to provide broad estimates of the annual expenditure necessary in this connection.

Headquarters staff in the Provinces-

Annual salary of Crop Insurance Officer on Rs.300/-p.m. including allowance.	...	3,600
Annual salary of 2 typists and clerks on Rs.100/-p.m. including allowance.	...	2,400
Annual salary of 1 peon on Rs.50/-p.m. including allowances	...	600
Travelling allowances per annum.	...	1,800
Stationery & contingencies per annum.	...	300
Total.		Rs.8,700

Field Staff -

Annual salaries of 4 crop Insurance Assistants each on Rs.150 including D.A. and fixed T.A.	...	7,200
Provision for stationery & postage at the rate of Rs.10 per assistant.	...	480
Annual salaries of 4 peons each on Rs.50/-p.m. including allowances.	...	2,400
Total.		Rs.10,080

Brought forward -

Headquarters staff	...	Rs.8,700
Field staff	...	" 10,080
		18,780

In addition to this provision will also have to be made for furniture, typewriters and other office equipment.

Additional provision will also have to be made for printing of necessary forms in connection with insurance work and in connection with the work of Crop Loss adjustment; provision will also be made for propaganda and publicity.

Additional item of cost will be commission to the agents selling insurance and any allowances to be paid to the revenue agencies in respect of their services. Perhaps it may suffice to provide 1 anna in a rupee of the premium income for this purpose. This will point to a figure of Rs.5,860 on the basis of estimates given earlier.

The total annual expenditure of the scheme in C.P. & Berar may therefore be summarised as follows:-

In connection with Crop Loss Adjustment.	14,000
Salaries and allowances of the permanent staff.	18,780
Commissions.	5,860
Printing, propaganda, publicity, etc.	1,500
Total.	Rs.40,140

21. A few remarks about the extent of the expenditure visualised above may be made here: First, a part of the expenditure, viz. the salaries of the headquarters staff and of the work in connection with the Crop Loss adjustment will be independent of the extent of participation in the scheme, and should therefore form a decreasing proportion of premiums as the participation increases. Secondly, in course of time a major part of the work could form the normal routine of the patwari. A much lesser degree of supervision of the work of crop loss adjustment will suffice. Also a good deal of the clerical work could be assigned to the patwari to an increasing extent and perhaps the increase in the number of Crop Insurance Assistants will also be limited; in any case they may be given cheaper clerical assistance. Thirdly, the crop cutting surveys on the full scale need be undertaken only in years when a crop loss of the requisite extent seems to be probable. It will be seen therefore that in judging the expenditure visualised above, it should be related to the position as is likely to emerge when the scheme has made headway and drawn a substantial degree of participation. It will be remembered that the pilot scheme stage is intended to provide necessary data for strengthening the statistical basis, to enable a study of the operation of various forms of the moral hazard and selectivity, to train the personnel for expansion of the scheme, and to provide experience for standardising techniques. These objectives of pilot scheme justify greater care and provision for closer supervision of the scheme during this stage. It is clear also that during this stage an effort must be made to secure as large a participation in the scheme as may be feasible.

LOSS RATIO DURING THE PILOT SCHEME STAGE.

22. It may be interesting to consider at this stage what operating deficits could reasonably speaking result from the operations of the scheme during the pilot scheme stage. For this purpose a

loss ratio, defined as the ratio of total indemnities during the quinquennium to the total premiums received during the quinquennium might be considered. It is clear that the actuarial basis visualises a balance between indemnities and premiums over a period much longer than 5 years and it is possible that an operating deficit indicated by a loss ratio greater than 1 might result in course of the working of even a sound scheme. One way in which the possibilities in this connection could be investigated would be to look back upon a past period of years, and see what might have happened if the scheme had been in operation in a quinquennium during such period. For this purpose the period from 1931-32 to 1946-47 was considered. It will be remembered that the actual premiums suggested have been obtained on the basis of a larger coefficient of variability than that obtained from either the seasonal factors or from the agricultural farm data. If the suggested premiums are used the possible operating deficits will therefore be understated. In the computations, therefore, loss experience based on each type of data was related to average premiums obtained directly from the corresponding data.

In respect of cotton, it was found that on the basis of seasonal factors, in no case did the indemnities exceed the premium income during a quinquennium. The maximum loss ratio during the quinquennium worked out as .94 and this occurred during the quinquennium ending 1935-36. The data from yields of the fields in agricultural stations showed higher loss ratios and is perhaps more reliable. In this case also the loss ratio was largest during the same quinquennium, being equal to 1.7; the next highest loss ratio referred to the quinquennium ending 1946-47 and was nearly equal to 1.

In case of wheat a much larger loss ratio was attained during the period. This is largely due to the fact that 1946-47 was year of almost complete crop failure in both the districts considered, and in fact the period since 1941 has included a remarkably large number of adverse seasons especially in Saugor. This may be seen from the following figures of seasonal factors during this period.

			YEAR.			
District.	1941-42	1942-43	1943-44	1944-45	1945-46	1946-47
Saugor	8.0	10.6	5.5	10.0	7.5	2.5
Hoshangabad.	7.0	10.6	10.1	8.4	8.6	1.6

The following remarks from the Season & Crop Report for 1946-47 will indicate the nature of the season: "The crop was growing satisfactorily and held out very good prospects in the beginning but at the time of its maturity had a very severe set-back owing to attack of rust caused by frequent occurrence of cloudy and rainy weather. No district was free from disease and the damage was considerable almost throughout the province. Rain and hail in March also caused some further damage to the crop lying on the threshing floor. The provincial outturn was 2.1 annas or 15.7%". It will be seen that the crop failure occurred at the very end of the season and it could not be said that the indemnity would not be equal to the extent of crop failure owing to the operation of the principle of increasing coverage with the progress of the crop. On the basis of the seasonal factors, the loss ratio works out at 2.7 for the quinquennium ending 1945-6 but is only 0.6 during the quinquennium ending 1944-5. However, the data of yields from the fields in the agricultural stations in the two districts show loss ratios of 4.8, 2.7, 1.6 during the quinquennia ending 1946-7, 1945-6 and 1944-5 respectively.

A feature of the proposed scheme is the additional safety derived from a pooling of risks resulting from spreading of insurance between different crops and different regions. It may not happen that a bad season for one crop will be bad for the other crop. This is illustrated in the present instance by considering the loss ratio resulting from the operations of the scheme as a whole, when due allowance is made for the extent of operations visualised in respect of each crop. The overall loss ratio based on the data from agricultural stations comes out to be equal to only 2.1 during the quinquennium ending 1946-7, 1.6 during the quinquennium ending 1945-6; these are of course not independent. The only other period during which the over-all loss ratio exceeds 1 is the quinquennium ending 1935-6 and the ratio then is only 1.2. It therefore seems fairly reasonable to assume that the indemnities are not likely to exceed twice the premiums; and it will be remembered that this position has in fact arisen only once during the period since 1931-2. It may be remembered also that a similar element of safety will be introduced into the scheme as a result of spreading of the operations of the pilot scheme between different

provinces. In fact since losses occur over vast areas as in case of wheat rust in C.P. in 1946-7, spreading of the operations of the scheme over the entire country would be a very important element conducive to the workability of the scheme.

SUGGESTIONS FOR A COMPULSORY SCHEME.

23. It will be noted that a purely voluntary scheme has been assumed in the foregoing discussion. A compulsory scheme of insurance will however have many attractions from the point of view of safety, cost and chances of successful working. It has been suggested that under such a scheme compulsion may be allowed only in respect of a part of the maximum permissible benefit, leaving the insured free to supplement this voluntarily. One practial way of doing this would be, for instance, to limit compulsion by laying down that each cultivator must take a policy of one of three classes, under which the benefits are respectively the maximum permissible benefits, three-fourths of such benefits and one-half of such benefits, with proportionate premiums. Further coumpulsion may be confined to only holdings larger than a certain minimum size.

It is clear that certain items of cost will remain the same irrespectively of the much larger participation in case of a compulsory scheme. If the crop loss adjustment is done on an area basis, the work and its cost will remain unchanged. Secondly in case of a compulsory scheme, much of the clerical work may be left to the patwari together with his normal routine. It may then suffice to appoint one Crop Loss Assistant in respect of each Revenue Inspector's Circle. Further, it may be possible to limit the operations of the scheme to a smaller area; e.g. to one revenue inspector's circle in each district.

24. It has also been suggested that a mixed scheme, under which compulsion is attempted in only certain suitable areas, while a voluntary scheme is permitted elsewhere will also have certain value. The rice areas in C.P. may prove a suitable area for such an experiment. As has been pointed out earlier a voluntary scheme may not prove very attractive in this region inspite of the low premiums. A compulsory scheme on the other hand, with compulsion limited to only half the permitted benefits will mean a premium of only 11 annas per acre.

A further suggestion for a compulsory scheme in all areas will be to limit compulsion in each region to such a part of the maximum benefit as will lead to premiums nearly equivalent to those for half the maximum benefits in case of rice. Thus, e.g., compulsion may be limited to one-fourth of the maximum benefit in case of cotton, 3/8ths of the maximum benefit in case of wheat and ½ of the maximum benefit in case of rice. If the short fall of the actual yield from 75% of the average yield is called the loss, the compulsory benefit will respectively be equal to one-sixth, one-fourth and one-third of the loss in the case of cotton, wheat and rice.

C_H_A_P_T_E_R VIII

CONCLUSION

1. The present interim report is intended to define a line of approach to a scheme of Crop Insurance in Indian conditions. The nature of the various problems that arise in this connection were briefly indicated in the concluding paragraphs of Chapter I. It may therefore be worth while, by way of concluding the discussion, to review the ground covered in finding answers to these problems.

First, the desirability of a simpler, safer and cheaper contract than the one current in U.S.A. was emphasised. In chapter II certain modifications, in the form of the U.S.A. contract have been suggested, which it is believed will be of value from this point of view. Firstly, a limitation of the maximum benefits permitted in the U.S.A. has been proposed which would be effective in controlling moral hazard. Secondly, it has been suggested that a contract under which the main benefits are payable on the basis of the condition of a separately demarcated area in which the insured farm is situated rather than on that of the farm itself, would limit moral hazard, simplify working and enable Crop Insurance machinery to be closely integrated with the land revenue machinery. Lastly, in chapter VII, the feasibility of a common premium rate in each region for each crop has been indicated with reference to conditions in C.P. and Berar.

Second, the problem of choosing between a compulsory and voluntary scheme has been discussed at some length in chapter III. A compulsory scheme has decidedly certain advantages, both theoretical and practical; but the question is whether a compulsory scheme is feasible in present circumstances. It has been pointed out that the opinions of the Provincial authorities might be obtained in this connection and that a scheme partly compulsory and partly voluntary would add to the value of the experience obtained during the pilot scheme stage. The lines on which such a mixed scheme could be organised in certain suitable areas have also been indicated.

Thirdly, the various sources of agricultural statistics have

been carefully investigated and their limitations pointed out in chapter VI. A new procedure for premium calculations has been suggested which, it is believed, will be an improvement in making the best use of available statistics. It has been pointed out that statistics obtained from different sources may have to be used in combination for obtaining suitable insurance coverages and premium rates and for demarcating suitable areas. The procedure outlined has been applied to conditions in C.P. and Berar in chapter VII and estimates of premium rates and insurance coverages obtained. A procedure for collecting suitable statistics during the pilot scheme stage for strengthening the statistical basis of the scheme has been outlined; in particular, in case of a contract based on the condition of an area, a crop cutting survey undertaken to determine the seasonal condition of the area could incidentally yield ancillary statistics which will meet to a large extent the needs in this respect.

Fourthly, in connection with suggesting a suitable agency for working a scheme of Crop Insurance, it seems unlikely that any insurance company will venture into this field or that the cooperative movement would be in a position to undertake the work in the near future. It seems therefore that the pilot scheme will have to be managed by the state. The revenue agencies in India are themselves in a sense running a Crop Insurance scheme and their primary field agencies will have to be integrated into the administrative organisation for Crop Insurance.

Next, in the matter of state-aid to the scheme it has been assumed that the expenses of management will be met by the state as in the U.S.A. The question whether an additional subsidy would be necessary or desirable is best considered in relation to the actual size of the premium rates; the various aspects of the matter have been carefully examined in Chapter VII, in respect of conditions in C.P. and Berar. While pointing out that the premiums do not appear to be so heavy as to demand an additional subsidy, a suitable basis for a subsidy during the pilot scheme stage intended to make insurance attractive, has been suggested.

2. The problems connected with the details of the pilot

.....

The Scheme have been discussed in chapters IV and V. The selection of crops and of areas has been discussed in chapter IV and the necessary data on the basis of which a selection of regions may be made has been provided. It is suggested however that the selection of the actual areas may be done in consultation with the provincial authorities in the light of certain considerations. In chapter VII actual areas in C.P. and Berar have been indicated. The extent of the areas has also been indicated. In chapter V, suggestions have been made for a suitable organisational set up for administering the pilot scheme. Estimates of the cost of much a set-up have been provided in chapter VII in respect of the proposed scheme for C.P. and Berar.

TABLE I.

(1) Indemnity payable in case the yield falls below 75% of the average.

(2) Size of the indemnity = $(\frac{1}{2} - \frac{p}{150})$ x Average yield.

= ($\frac{1}{2}$ Average yield) - 2/3 (Actual yield)

Where p = actual yield expressed as percentage of average.

Premiums expressed as percentages of the average yield per acre.

Coefficient of variability	25%	30%	35%	40%
Premium ...	1.39%	2.24%	3.25%	4.32%

Actual Premiums.

Average yield per acre (1 ha.)	Coefficients of variability.			
	25%	30%	35%	40%
200	2.77	4.47	5.57	8.63
250	3.47	5.58	8.13	10.79
300	4.17	6.69	9.77	12.95
350	4.86	7.81	11.39	15.09
400	5.55	8.93	13.02	17.27
450	6.25	10.04	14.65	19.43
500	6.94	11.16	16.27	21.59

T A B L E II

ESTIMATES OF SEASONAL VARIABILITY DERIVED FROM THE 'SEASONAL FACTORS' AND FROM THE YIELD DATA FROM AGRICULTURAL FARMS

C O T T O N.

SOURCE OF DATA	DISTRICT SURAT		DISTRICT KHANDESH		DISTRICT DHARWAR	
	PERIOD	COEFFICIENT OF VARIABILITY	PERIOD	COEFFICIENT OF VARIABILITY	PERIOD	COEFFICIENT OF VARIABILITY
'Seasonal Factors'	1889-90 to 1931-32	23.7%	1889-90 to 1931-32	27.1%	1889-90 to 1931-32	29.2%
Agricultural Farms	1907-08 to 1932-33	27.0%	1913-14 to 1931-32	(36.6% N.P.Cotton) (38.5% (Local Seed Cotton)	1908-09 to 1931-32	36.5% (Kumpta cotton)

Source: (i) 'Notes on analysis of yields of crops at the Government Experimental Farms in the Central Provinces and in the Bombay Provinces'

(ii) 'Influence of weather on the yields per acre of cotton in the Bombay Presidency', by Kalamkar, Satakopan and Gopal Rao Supplements to the Report of the Agricultural Metereology Branch. Indian Metereology Department, 1935.

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T__A__B__L__E III

C_O_T_T_O_N

AVERAGE YIELDS PER ACRE AND COEFFICIENTS OF VARIABILITY OF THE YIELDS OF COTTON ON THE EXPERIMENTAL FARM AND SEED AND DEMONSTRATION FARMS IN THE WESTERN CIRCLE OF C.P. & BERAR

Name of Farm	District	Period	Variety	Average yield (lbs.)	Coefficient of variability.	No. of years on which the yield was below 75% of average	Premiums by the U.S.A. Method expressed as percentage of the average yield.
1. Akola	Akola	1933-34 to 1946-47 (14 yrs.)	V.434	496	29.9%	3	1.92%
		1923-24 to 1946-47 (24 yrs.)	average of all varieties of cotton.	516	33.6%	7	2.40%
2. Basim	Akola	1924-25 to 1938-39 (15 yrs.)	Roseum	276	36.2%	4	3.37%
		1927-28 to 1938-39 (12 yrs.)	V.262	302	32.6%	3	2.93%
		1935-36 to 1946-47 (12 yrs.)	V.434	323	34.5%	2	4.09%
3. Borgaon	Akola	1924-25 to 1940-41 (17 yrs.)	Roseum	471	25.4%	5	0.91%
		(1934-35 to 1946-47 (12 yrs.) (with 42-43 missing)	V.434	360	41.5%	3	3.99%
4. Ellichpur	Amraoti	1935-36 to 1946-47 (12 yrs.)	V.434	435	31.9%	3	2.01%
5. Buldana	Buldana	1928-29 to 1938-39 (11 yrs.)	Roseum	334	49.8%	4	7.59%
		1929-30 to 1938-39 (10 yrs.)	V.262	416	31.3%	3	1.25%
		1933-34 to 1943-44 (11 yrs.)	V.434	463	37.2%	4	3.55%
6. Yeotmal	Yeotmal	1924-25 to 1936-37 (13 yrs.)	Roseum	345	30.8%	3	2.79%
		1931-32 to 1946-47 (16 yrs.)	V.434	336	35.2%	4	3.15%
7. Khandwa*	Nimar	1933-34 to 1946-47 (14 yrs.)	V.434	355	31.8%	2	2.39%

* Remained in the Western Circle upto 30-31 and in 1931-32 transferred to the Northern Circle.

T__A__B__L__E IV

WHEAT

AVERAGE YIELDS PER ACRE AND COEFFICIENTS OF VARIABILITY OF THE YIELDS OF WHEAT ON THE SEED AND DEMONSTRATION FARMS IN THE NORTHERN CIRCLE OF C.P. AND BERAR.

Name of Farm	District	Period	Variety	Average Yield (lbs.)	Coefficient of variability	No of years when yield was below 75% of average yield	Premium by the U.S.A. method as expressed as percentage of average yield.
Saugor	Saugor	1925-26 to 1946-47* (22 yrs.)	A-115	447	29.2%	3	2.40%
Saugor	Saugor	1931-32 to 1946-47* (16 yrs.)	A0-13	471	28.7%	4	1.63
Ratona Section	"	1925-26 to 1946-47* (23 yrs.)	A0-90	409	33.6%	4	1.71
Powarkhera	Hoshanga-bad	1923-24 to 1946-47** (23 yrs.)	A.115	431	26.8%	4	1.91
Powarkhera	"	1931-32 to 1946-47** (15 yrs.)	A0:85	475	44.2%	3	5.55
"	"	1923-24 to 1946-47 (25 yrs.)	A0:13	424	33.8%	5	3.61

* The figure of yield for 1938-39 is missing and has not been taken into account.

** The figure of yield for 1936-37 is missing and has not been taken into account.

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T A B L E V

PADDY

AVERAGE YIELDS PER ACRE AND COEFFICIENTS OF VARIABILITY OF THE YIELDS OF PADDY ON THE SEED AND DEMONSTRATION FARMS IN THE EASTERN CIRCLE OF C.P. AND BERAR

Name of Farm	District	Period	Average yield (lbs.)	Coefficient of variability	No. of years when yield was lower than 75% of average.	Premium on the U.S.A. basis expressed as percentage of average yield
Chandkhuri	Raipur	1922-23 to 1946-47 (25 years)	1,255	19.7%	2	0.83
Ruabanda	Drug	1922-23 to 1946-47 (25 years)	2,052	21.4%	3	1.00
Sarkanda	Bilaspur	1922-23 to 1942-43 (21 years).	1,754	25.8%	3	1.53

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TABLE VI

Statement showing the average yield per acre of seed cotton (kapas) of each taluk and district in C.P. and Berar cotton tract as per Revenue Soil Classification based on depth, texture, structure and colour of soil for 1944-45 to 1946-47.

Yield in lbs. per acre of kapas as per Revenue Soil Classification.

District	Taluk	Class I above 31"	Class II Above 31"	Class III 28"to 31"	Class IV 22"to 27"	Class V 16"to 21"	Class VI 10"to 15"	Class VIII to IX 0" to 9"
AKOLA	Akola	172	203	181	262	176	160	112
	Akot	-	202	200	253	165	174	196
	Balapur	398	300	212	177	210	119	156
	Basim	-	-	170	185	132	135	131
	Murtizapur	-	193	292	183	140	108	124
	Mangrulpur	-	20	219	137	177	177	154
	Weighted average per district.	370	219	214	189	153	142	142
BULDANA	Chikhali	-	205	175	200	181	133	131
	Mehkar	-	152	167	273	205	169	140
	Khamgaon	319	344	248	229	276	164	173
	Malkapur	265	247	233	234	221	122	158
	Jalgaon	291	378	274	184	220	133	-
	Weighted average per district.	275	281	221	224	215	142	151
YEOTMAL	Yeotmal	-	256	268	235	156	178	158
	Darwha	-	431	244	255	235	200	110
	Pusad	-	265	291	270	233	138	159
	Kelapur	-	245	243	186	178	154	133
	Wun	342	114	179	156	274	177	179
	Weighted average per district	243	251	248	232	226	174	142
AMRAOTI	*Amraoti	-	-	211	104	223	135	108
	Chandur	-	-	214	175	154	130	111
	Morshi	-	-	172	299	180	197	86
	Ellichpur	-	-	213	142	143	197	109
	Durgapur	-	-	217	221	81	185	-
	Weighted average per district	-	-	202	156	158	150	105

*The soil classification of soil in Amraoti district is not according to revenue soil classification but according to soil depth.

TABLE VII

C.P. AND BERAR.

Commodity	District	District acreage under the crop as percentage of provincial acreage under the crop (period 1936-7 to 1938-9).	District acreage under the crop as percentage of the total cultivated district acreage (Av.1936-37 to 38-39).	Average yield per acre in the district.	Agricultural Farms in the district.
1. COTTON	Akola	25%	42.87	200.6 (a)	3 (Basim, Borgaon, Akola)
	Amraoti	25%	46.71	205.8 (a)	1 Ellichpur
	Yeotmal	22%	39.77	209.0 (a)	1 Yeotmal
	Buldana	19%	36.22	183.4 (a)	1 Buldana
2. WHEAT	Damoh	7%	-	-	-
	Saugor	17%	48.09	435 (b)	1 Saugor
	Hoshangabad	13%	31.28	421 (b)	1 Powarkhera
	Nagpur	6%	13.58	313 (b)	1 Nagpur
3. RICE	Raipur	27%	58.06	581 (b)	2 (Chandkhuri (Labhandi
	Bilaspur	23%	56.07	580 (b)	1 Sarkanda
	Drug	14%	39.92	630 (b)	1 Ruabanda

(a) Derived from data of crop cutting experiments on random sampling basis during 1944-45 to 47-48.

(b) Average yield of forecast figures for the decennium ending 1945-46.

TABLE VIII

ANALYSIS OF SEASONAL FACTORS - DATA FOR CP. AND BERAR.

Commodity	District	Period	Average seasonal factor.	Coefficient of variability.	No.of years in which the yield was below 75%	Premiums by the U.S.A. method expressed as percentage of the average yield.
Cotton	Akola	1919-20 to 1946-47	9.87	25.75 %	3	0.90%
	Amraoti	-do-	10.30	28.92%	4	1.60%
	Buldana	-do-	10.12	26.88%	4	1.73%
	Yeotmal	-do-	9.68	26.07%	6	0.92%
Wheat	Hoshangabad	-do-	10.22	27.25%	3	2.21%
	Saugor	-do-	10.29	34.20%	6	4.35%

S_U_M_M_A_R_Y O_F C_O_N_C_L_U_S_I_O_N_S.

1. A scheme of all-risk Crop Insurance under which protection is given against all crop hazards beyond the control of the insured is recommended.

2. An approach on the basis of a pilot scheme on a limited but adequate scale, under which insurance is limited to selected crops and selected areas may be considered as essential.

3. The form of the contract may be as follows:-

(a) The indemnity will be equal to two-thirds of the shortfall of the actual yield from specified percentage of the long-term average yield.

(b) In case of losses due to widespread ' general calamities' the indemnity may be paid on the basis of the seasonal condition of a suitably defined ' area' in which the farm is situated. This will be supplemented in case of losses due to 'local calamities' like hail, flood or locusts by indemnities payable on the basis of the seasonal condition of the insured farm itself.

The work of ascertaining the average yield of an ' area' in connection with adjusting crop losses may be carried out through the precise and objective method of a crop cutting survey on the principles of random sampling. The work in connection with such surveys could with advantage replace the present functions of the revenue agencies.

4. In Indian conditions, a compulsory scheme of Crop Insurance has considerably theoritical and practical advantages. However, it is also felt that a compulsory scheme may not be immediately feasible and may be misconstrued as additional taxation and resented. Opinions of the provincial governments about the feasibility of a compulsory scheme may be obtained.

In any case the pilot scheme could with advantage work on a compulsory basis in at least certain areas. Certain areas, protected by irrigation or by an assured rainfall may be suitable for operating a compulsory scheme.

Compulsion may be limited to only a fraction, such as one half, of the maximum permissible benefit; and the remaining part may be left to be covered by the insured at his option. Further compulsion may apply to only holdings larger than a certain minimum size to be prescribed in different areas.

.....A

5. A state subsidy to the scheme sufficient to cover the expenses of administration is recommended. Consideration may also be given to giving an additional subsidy during the pilot scheme stage as an inducement to insure. The question is discussed at some length in connection with actual premium rates in C.P. and Berar.

6. The different sources of agricultural statistics in India will have to be utilised in combination for determining premium rates and insurance coverages. A suitable method which may facilitate this and has certain other advantages is suggested. The data from government agricultural farms may supply reliable estimates of seasonal variability. This may perhaps be supplemented by investigations into unpublished seasonal factors relating to the primary units in respect of which they are reported. The stability of seasonal variability in respect of various regions and crops suggests that a uniform premium rate in each region may be feasible. The average level of yields in different areas will have to be determined on the basis of official statistics of normal out-turns and results of crop cutting surveys recently carried out. Investigations may be made on the basis of the yeilds obtained during such surveys to test the performance of various revenue soil classes, so as to test the utility of revenue soil classification for demarcating ' areas'. The ancillary statistics obtained in connection with these surveys may also enable allowance to be made for types of irrigation, varieties, manures, etc. In addition to this, studies in the various areas may be needed in relation to the dates of various agricultural operations, the costs at various stages of production, nature and incidence of crop hazards, etc.

During the pilot scheme stage data may have to be collected to strengthen the statistical basis of the scheme. The relevant information may be obtained as ancillary data in connection with crop-cutting surveys suggested for the purpose of crop loss adjustment.

7. It will be desirable to insure more than one crop and to spread the areas of operation in respect of each crop over widely spaced geographical regions.

The possibility of insuring two food crops, viz. rice and wheat, and two commercial crops, viz. cotton and sugarcane, may be studied in the first instance.

....Insurance

Insurance in respect of each crop may be offered in all the major producing provinces; and in each such province, in representative areas in regions of concentrated production. Such areas are indicated.

It may be necessary to exclude the permanently settled areas and East Punjab from the operation of the scheme in the first instance.

Insurance operations in respect of each crop may be limited to a maximum of 20 Revenue Inspector's circles. The following distribution of areas over the different provinces may be suggested:

P_R_O_V_I_N_C_E_S.

Commodity	Madras	Bombay	U.P.	C.P. & Berar
Rice	12	..	4	4
Wheat	..	..	12	4
Cotton	4	8	..	6
Sugarcane	..	..	10	..

In case of a compulsory scheme, it may suffice to provide insurance in one circle in each region and the area of operation may be reduced to nearly a half.

8. During the experimental stage, the scheme should be entirely State-managed; but local co-operative societies could help in the work of selling insurance and publicity on a commission basis. The field agencies of the agricultural departments may also help in popularising the scheme and in connection with preliminary studies. The more extensive field agency of the revenue department could be depended on for primary field work. The patwari could receive premiums, check acreages, carry out routine inspections and the work of sample harvesting in connection with annual crop surveys may replace his normal routine.

The operation of the scheme in each Province may be placed in charge of a Crop Insurance Officer. He will maintain records, receive premiums and keep accounts, process claims, and supervise work at all levels. He will also organise the collection of statistics required for operation of the scheme and its extension. He will be helped by clerical staff at his headquarters and by Crop Insurance Assistants one of which may be stationed in each centre in which it is proposed to operate the scheme.

The Provincial Crop Insurance Officers will be responsible to a central office where plans of insurance and suitable actuarial basis will be evolved;

statistics collected and analysed; premiums and insurance coverages for different regions ascertained; the working of the scheme reviewed and the question of its extension decided.

While in course of time the work of the suggested crop cutting surveys may form part of the revenue agencies, during the pilot scheme stage very adequate supervision over the work of sample harvesting may be provided. This may be done by appointing of supervisors during the harvesting season. Recruitment of persons of experience and standing as Supervisors may be done through popular bodies in respective centres and a suitable honorarium may be paid to such persons.

It may be advisable to associate advisory committees consisting of officials and non-officials in each centre with the working of the scheme.

9. During the pilot scheme stage it may be advisable to avoid setting up such reserves in view of the limited scale of operations. The operations may be carried out in terms of current cash equivalents and government may bear the impact of any adverse movement of prices.

10. In the light of the foregoing conclusions the various details in respect of the operation of the scheme in C.P. & Berar have been worked out. These include estimates of appropriate premium rates and insurance coverages for selected crops and areas, of the scale of operations, of the expenses of administration, etc.

APPENDIX A.

ALL - RISK CROP INSURANCE IN THE U.S.A.

1. In the following paragraphs an account of the various aspects of the All-risk Crop Insurance scheme at present in operation in the U.S.A. is given. This was based on such scanty material as was available to me; and is not intended to be either complete or authoritative. Some inaccuracies in the presentation are also possible. The intention has been to emphasise the principles behind the various procedures, since the object of the review is to utilise the experience in the U.S.A. for evolving a scheme for application to Indian conditions.

CROP INSURANCE IN THE U.S.A. YET IN AN EXPERIMENTAL STAGE.

2. In the U.S.A. attempts by numerous private companies have been made at providing all-risk crop insurance to the farmer during the last 50 years, and crop insurance has been considered as a subject of national interest during the last 30 years, a special Senate Committee having been appointed in 1923 to investigate the entire subject. The experience of the private insurance companies was costly and they had to withdraw from the field. The Congress in the U.S.A. passed the Federal Crop Insurance Act in 1938 and this provided all risk Crop Insurance on wheat beginning with 1939 crop year. The U.S.A. plan of insurance embodies the experience in this important field of all these years, and has been itself visualised as of an experimental and exploratory character. All-risk Crop Insurance has nowhere else been attempted on the same scale and with the same success and a study of the main features of the American plan, the extensive research that has preceded its formulation and has been going on in connection with its working, and the various modifications in the nature and scope of insurance introduced since 1939 must therefore necessarily form an essential preliminary to any attempt to organise crop insurance in any other country.

The following have been mentioned as the major factors in the failure of the attempts by private companies:

(i) Insurance of income rather than loss of yield;

(ii) inadequate data for determining the degree of risk;

(iii) adverse selectivity of insurance risks through late season sales.

The plan evolved by the Federal Crop Insurance Corporation has taken into account all these difficulties and the special features of this plan may therefore repay careful study.

3. Before proceeding to present a brief account of such features of the U.S.A. scheme it is however necessary to emphasise the essentially experimental character of the approach ever since the inception of the scheme. The Act of 1939, confined Crop Insurance to only one commodity and provided for studies to be made which could be used as a basis for expanding the programme to additional commodities. The amendment to the Crop Insurance Act in 1944 introduced substantial modifications in the main plan of insurance on a limited experimental basis in extending insurance to additional commodities. In 1947 the Congress reviewed the entire operations of the corporation, and the result of its findings was to place the entire crop insurance programme on an experimental basis. It was decided that the programme should be extensive enough so that experience would be representative of the problems of all areas, but at the same time restrictive enough so that the cost of experience would not be burdensome to the Government. The following views of the House Committee deserve mention in this connection.

"The Committee believes it should be recognised that the development of a sound insurance programme covering even the major agricul - tural commodities on a nation-wide basis is a long time project that may well take years in its accomplishment. It does not believe that this can be accomplished overnight nor that it is reasonable to expect that a half-dozen crop seasons of experience will achieve for crop insurance what it took other forms of commodity insurance many years of trial and error to develop". The 1947 amendment to the Federal Crop Insurance Act provides that, commencing with the 1948 crop year, crop insurance may be offered in not more than 200 count-ies in case of wheat, 56 count-ies in case of cotton, 50 count-ies in case of corn and flax and 35 count-ies in case of tobacco. Crop Insurance may also be offered beginning with the 1948 crop year on two additional commodities in not more than 20 count-ies. Other new commodities may be added commencing in 1949 at the rate of not more than three commodities per year. It must be recognised that the need for this approach arises from the complex nature of this form of insurance. "The trial and error method has played a big part in the development of insurance as it is to-day. Crop insurance is no exception, other than that it contains more complex problems than other types of insurance". The lessons to be learnt from the history of the American approach to Crop Insurance, may therefore be stated as follows:-

Firstly, adequate preliminary research and study in relation to problems arising out of each crop and each locality will have to precede any plan of Crop Insurance.

Secondly, there are lessons to be learnt and information to be secured which cannot be obtained by study and research alone, and for this an experimental approach will be necessary. Certain types of hazards inherent in insurance of this type can only come to the surface as a result of actual working and insurance plans can be tried and tested and changes made which will make insurance safer from the point of view of the insurer and the national economy and more valuable and attractive from the point of view of the insured.

Thirdly, for deriving the full value from such experimentation it should be tried on an adequate scale. While it should be realised that allowance must be necessarily made for the very different conditions in India, a detailed study of the experience gained in course of the American plan must necessarily result in a saving in time and resources. The literature available on the subject is however exceedingly limited.

MAIN FEATURES OF THE CONTRACT, THEIR EVOLUTION AND THE PRINCIPLES UNDER-LYING THEM.

4. The following is a brief account of the main features of the scheme current in the U.S.A.:-

(a) Crop Insurance is administered by the Department of Agriculture through the Federal Crop Insurance Corporation.

(b) The scheme is entirely voluntary and mainly self-supporting. The Government subsidy is limited to meeting the expenses of administration.

(c) Crop Insurance has been extended from one commodity to another. Insurance on Wheat was offered on a nation-wide basis in 1939 on cotton in 1942 and on flax in 1945. It was offered on a limited experimental basis on corn and tobacco in 1945. As pointed out above the scope of the insurance on each commodity has been limited by the 1947 Act. New problems arise in extending insurance to new commodities and considerable research by the Bureau of Agricultural Economics has preceded extension to each new commodity, e.g., extension of the insurance to cotton involved problems like the following:-

"Cotton is a cultivated crop while wheat is not. Cotton

crops require insect control and in some areas are dependent in large measure on the fertiliser used. Furthermore, in insuring cotton it will be necessary to provide some arrangement whereby share-cropper's interests in the crop can be insured".

(d) Producers of insured crops are protected against all unavoidable production hazards, such as floods, droughts, insects and plant diseases. One of the main difficulties of crop insurance is to find methods by which while protecting the farmer against all principal hazards over which he has no control, to exclude the losses resulting from his negligence or malfeasance from such protection. It will be realised that the extent of the losses caused by unavoidable causes might itself depend on the care and skill and resources of the cultivator. The following statement defining the risks insured against in case of cotton may help to give an idea of the complexity of the situation.

Causes of loss insured against - The insurance contract shall cover loss in yield of lint cotton (and cotton seed production, if insured) due to unavoidable causes, including drought, flood, hail, wind, frost, winter-kill, lightning, fire, excessive rain, snow, wild life, hurricane, tornado, insect infestation, plant disease and such other unavoidable causes as may be determined by the Board of Directors of the Corporation. Provided, however, that the Board of Directors may determine that for any county or area the insurance contract shall provide that loss due to any of the foregoing causes is not insured.

Where insurance is written on an irrigated basis, the insurance cover shall also cover loss in yield due to failure of water supply from natural causes that could not be prevented by the insured, including (a) lowering of the water level in pump wells adequate at the beginning of the growing season to the extent that either deepening the well or drilling a new well would be necessary to obtain an adequate supply of water,

(b) failure of public power used for pumping or failure of an irrigation district or water company to deliver water where such failure is not within the control of the insured, and

(c) collapse of casing in wells where such collapse could not have been foreseen and prevented by the insured.

Causes of loss not insured against.- The contract shall not cover damage to quality in any case, or loss in yield caused by:

(a) Neglect or malfeasance of the insured or of any person in his household or employment or connected with the farm as tenant, sharecropper or wage hand;

(b) theft;

(c) domestic animals;

(d) failure to follow recognised good farming practices;

(e) poor farming practices, including but not limited to the use of defective or unadapted seed, failure to plant a sufficient quantity of seed, failure properly to prepare the land for planting or properly to plant, care for or harvest (including unreasonable delay thereof) the insured crop;

(f) following different fertiliser or farming practices than those considered in establishing the average yield, or planting cotton on land where the average productivity or farming hazards differ materially from the average productivity or farming hazards for the acreage considered in establishing the average yield and premium rates for such farm or part thereof;

(g) failure to replant cotton where the Corporation determines it is practicable to replant;

(h) planting cotton under conditions of immediate hazard;

(i) planting excessive acreage under abnormal conditions;

(j) planting another crop in the growing cotton crop (except winter legumes);

(k) planting a variety of cotton which differs materially in yield from the variety considered in establishing the average yield for the farm or part thereof;

(l) inability to obtain labour, seed, fertiliser, machinery, repairs or insect poison;

(m) breakdown of machinery or failure of equipment due to mechanical defects;

(n) failure properly to apply irrigation water to cotton in proportion to the amount of water available to irrigated crops;

(o) failure to provide adequate casing or properly to adjust the pumping equipment in the event of a lowering of the water level in pump wells where such adjustment can be made without deepening

the well;.

(e). Under the main types of insurance the contract takes the form of a guarantee against the loss of yield, not against loss in the value of the crop. Premiums and reserves are also expressed in terms of commodity. As pointed out above, an attempt to insure income rather than yield, under conditions of uncontrolled price variations, was one of the causes of the failure of previous schemes of all-risk crop insurance. The reason for guaranteeing actual produce, and not its value as would be more desirable, is that while factors affecting production are largely physical and therefore to a great measure predictable, prices are to a considerable extent determined by human actions. For deriving the full benefit out of a crop insurance scheme of this nature it is therefore necessary to work it together with a programme of price support. Also, where a large part of the commodity is consumed by the producer himself, or used for payment in kind for goods and services, crop insurance on yield basis may have considerable value even in the absence of such a programme. The existence of a price support programme will also enable a substantial simplication in the working of Crop Insurance. In fact the 1947 amendment to the Federal Crop Insurance Act in the U.S.A. permits the Corporation to compute the cash equivalent of premiums and indemnities on the basis of the parity or comparable prices for the commodity as determined and published by the Secretary of Agriculture. "This will permit the establishment of a commodity price before insurance is sold. Where this is done insurance can be sold on the basis of a premium rate quoted in terms of dollars. Its use will also preclude the necessity of carrying premium reserves in commodity units rather than dollars for yield insurance. These commodity operations have been rather expensive in prior years".

(f). A percentage of the long term average yield of the insured farm (or a comparable figure) is guaranteed as the sum assured under the contract. There are two optional coverages for commodities other than cotton, 50% and 75% of the average yield; and three for cotton, 40%, 60% and 75% of the average yield. In case of actual yield in any year falling below the guaranteed level the difference is made up by an indemnity under the contract. Under partial insurance features, farmers may obtain insurance ranging from 60 to 100% of the protection guaranteed by any of the basic coverages.

The limitation of coverage to a fraction of the average yield is

an important safeguard against moral hazard. The need for this will be realised when it is remembered that crop insurance guarantees a form of property that is yet to come into existence and that its coming into existence itself depends on efforts on the part of the insured. Insurance of the full yield will leave no incentive for putting forth the maximum effort. It will also make insurance very expensive.

Another reason for guaranteeing only a portion of the produce appears to have been the feeling that "the amount of insurance must not cover theoretical losses resulting from failure to reap expected profits. Insurance that is written to protect against anticipated profits will not only be too costly but it will tend to discourage diligence and care on the part of the farmer. The investment in the insurance should probably serve as the basis for fixing the amount of insurance carried". (U.S. Department of Agriculture, Year Book 1924 p. 255). The 1947. Amendment to the F.C.I. Act. provides firstly that insurance against loss of yield cannot cover more than 75% of the average yield for the farm, and secondly that if 75% of average yield represent generally more protection than investment in the crop in the area this maximum percentage is to be reduced to more nearly reflect the investment in the crop in the area. The purpose of this is to avoid over-insurance and at the same time to afford protection equal to approximately the investment in the crop. It may be pointed out that dangers of over-insurance of this type are likely to prove exceedingly limited in India, where agriculture is known to be largely a deficit occupation, in the sense that commercially it does not leave the farmer a net profit after making allowance for all the elements involved inthe cost of production, including interest on farm investment and cost of labour of the farmer and his family.

It is clear that if a crop failure occurs sufficiently early in the life of a crop there will be a considerable saving in labour and other parts of insurance. In such circumstances the full insurance coverage will result in over insurance. This was recognised for the first time in 1945 and the insurance contract modified so that the amount of insurance coverage increased with the progress of the crop. If the crop is destroyed or substantially destroyed early in the growing season but after it is too late to replant to the insured commodity and the acreage is released by the corporation for other use, then the amount of protectionis only 40 to 50% (depending on the commodity) as large as it would be if the crops were

harvested. From there on the amount of protection increases progressively with the stages of the crop. The amounts of coverage at different stages are determined so as to provide protection which is approximately in line with costs and the value of the crop at various stages of production. The full insurance protection applies only to harvested acreage. "It was found from experience in previous wheat and cotton programmes that frequently a grower could obtain more net income from an indemnity than from a crop if he did not incur the full cost of producing and harvesting the crop. A typical example of this is found in the treatment of two insured growers, one of whom produced the insured yield and the other had a total crop failure. Both of these growers obtained the insured yield from either actual production or an indemnity, yet the second grower incurred no harvesting and marketing costs and in the case of cotton, may even have saved earlier production costs. He may also have received an income from a substitute crop. In such a case it frequently was more profitable to have a loss than to produce a crop." The plan has also "the advantage of encouraging the harvesting and of partial crops which is particularly desirable in view of the current world need for food and feed."

It has been suggested that in India the 'farm income' or the so called "net income" should be taken as the basis for determining the level of insurance coverage, since in years of crop failure a good deal of the expenses of production could be saved. Apart from such limitations as may have to be placed for reasons of cost of insurance etc., it would appear that a contract guaranteeing the full invest-ment income, but making allowance for the degree of cost saved owing to crop failure at an early stage will be much more satisfactory in view of the objectives which crop insurance is intended to serve.

The difficulty of setting appropriate levels of coverage at different stages of production may be realised from the fact that for cotton the 1946 limits were found to be high enough to provide a profit and had to be modified by further lowering coverage for the early stages of production to a substantial extent. This was considered to be one of the secondary factors contributing to the heavy cotton losses in 1946.

(g) The premiums were originally determined on the principle of averaging yield experience of individual farms for good and bad years, and to a certain extent averaging the experience of good and bad farms in a count-y. It was found, however, that determining premium rates for individual farms was not practically feasible; and since 1945 uniform premium rates are determined for each county by averaging the individual loss experience of all the farms in the county; provision being made for special rates for exceptionally high risk farms.

The premiums like the sum assured are expressed in terms of the commodity and not in terms of cash. In practice, however, both premiums and indemnities may be paid in terms of cash, current prices at the date of payment being utilised for the purpose. However, the cash received as premium will immediately be turned into commodity, and commodity sold to produce cash to pay indemnities.

(h) Since insurance is based on the principle of averaging the experience of good and bad years, in some years the premiums will exceed the indemnity payments and in some others fall below the current indemnity payments. Wheat insurance indemnities exceeded the premiums in each of the first 5 years of operation, but this trend was reversed in 1945 and by the end of 1947 crop year wheat insurance operations for the 8years will show premiums collected almost equal to indemnities paid. On the other hand, cotton insurance has shown a deficit every year, the losses for both 1945 and 1946 being unusually heavy due principally to poor crop conditions. In 1947, premium balances accumulated on wheat, tobacco and corn; a slight loss was experienced in flax with substantial losses in cotton; the heavy cotton losses exhausted the paid up capital of the corporation and forced the temporary suspension of payment of cotton indemnities.

One of the principles of the American plan is that reserves will be carried in terms of commodity. In fact, the corporation works on the basis of an Evernormal Granary. The surpluses of good years accumulated as a result of premiums exceeding indemnities, are available as a reserve during years of wide spread crop failures.

Where a price support programme is in operation the cost

of administration of the storage reserves could be avoided and sums assured, premiums and reserves expressed in terms of money values. As pointed out above provision for enabling this simplification to be introduced into the scheme has been made in recent legislation.

(i) In connection with the trial insurance for tobacco and corn an alternative plan of insurance was also offered. This is called the Investment Loss plan of insurance and guarantees 75% of the cost of production to the insured. The actual indemnity takes the form of the payment of the difference between 75% of the cost of production and the value of the actual yield. This naturally brings price fluctuations into the picture and the usefulness of the plan will therefore depend on the existence of a price support programme as in the U.S.A.

Under the trial scheme for corn the investment or typical cost per acre was determined by making a detailed study of the cost of production. Under this plan the amount of insurance was settled in dollars instead of in commodity units. Investment insurance afforded lower protection, ranging from about one-half to two thirds of that provided by yield insurance.

For corn two types of investment insurance were tried. The first type set a basic amount of protection per acre for each country. The basic amount was not in excess of 75% of typical cost per acre and was applicable to all farms in the county with a few exceptions which were the abnormally low yielding farms. Under the second type all farms were generally grouped into three classifications, low yield group, average yield group and higher than average yield group. A low basic amount of insurance was established which was applicable to all farms within a yield group. This basic amount of insurance could be increased by the farmer by following certain yield increasing practices, such as application of fertiliser, use of hybrid seed, etc. The maximum protection under this plan could not exceed 75% of the investment in the crop.

(j) An attempt to take quality into account in insurance was made under the Yield Quality plan of insurance of tobacco. Although the yield of tobacco may be relatively good, such factors as plant diseases or weather conditions frequently cause low-quality tobacco, for which a relatively low price is received. Consequently, in such cases, insurance against loss of yield alone would afford

inadequate protection.The dollar amount of the yield quality insurance is determined at the end of the season. It is based on not to exceed 75% of the long term average yield for the farm and a representative price for tobacco in the year of insurance, as adjusted upward or downward for an individual farmer to reflect the average quality of tobacco produced by him in past years. This adjustment is based on the farmer's past experience in selling at prices above or below the market average price. As in investment insurance, if the returns from the crop in the year of insurance are less than the guaranteed amount, the insured farmer is indemnified.

ACTUARIAL BASIS OF CROP INSURANCE IN THE U.S.A.

5. The original methods developed when the Federal Crop Insurance Corporation was created in 1938, have been modified subsequently as added experience was gained, to reflect certain factors which had not been recognised or properly evaluated at the outset. The following is a brief outline of the main features of the methods used and their evolution:

(i) One of the basic principles of the original plan of insurance was that of individual farm rating- i.e. each farm has its own coverage per acre based on its average yield and its own premium rate. It is essential for the very feasibility of such crop insurance that the insurance coverage for each farm should be based on yields comparable to its own. If each farm were insured for an equal number of bushels per acre, the low producing farms would be over-insured and tend to collect indemnities frequently while the high producing farms would seldom collect an indemnity; and in a voluntary scheme, only the over-insured low producing farms would join, thereby upsetting the entire actuarial basis.

(ii) The limitations of data available at the outset of each extension of the scheme was a factor that had to be allowed for in the actuarial basis. Such extensions were effected when data of individual farm yields were available for a short period of 5 or 6 years. This period was however not considered sufficiently long to be representative and adjustments were made to bring the rates obtained into conformity with experience of a representative period of years, considered to be of sufficient length

to reflect all hazards of producing the crop in the county. Thus for cotton individual farm data were available at the outset for the six year period 1933-38, while since a 11 year period was considered representative, the adjustment factor was based on the data of county yields for 1928-38. As more and more data were collected the period over which the individual farm data were available would be longer, and the adjustment factors so long as they were required would relate to periods ending with the latest year. A 16 year period was considered as representative for corn, while a 13 year period appears to have been used for wheat.

(iii) Yields and premium rates were determined for all wheat farms in the county in advance of the application - writing period by the county committees. To provide a further control over the work done by the county committees, after the preliminary average yields and preliminary premium rates were established for all farms in the county, such yields and premium rates were then adjusted to a County Check Yield and a County Check Premium Rate by use of uniform adjustment factors. The county check yield was an average of county average yields covering a representative period of years, considered to be of sufficient length to properly reflect all the hazards of producing the crop in the county. The County Check Premium Rates were determined on the basis of the crop loss experience computed for a representative sample of farms which were drawn from each county in which crop insurance was to be offered. Such crop loss experience was available only for the years for which individual farm data was available, but estimates of the crop loss experience for other years of a suitable representative period were made on an appropriate basis by establishing a relationship between the level of the county crop loss experience in a year and the level of the county average yield for the year, each being expressed as fractions of the average yield for the whole period.

(iv) In 1945, it was recognised on the basis of earlier experience that the risk of loss of individual farms could not be

measured accurately enough from the available data to establish individual farm premium rates. On the basis of this experience it was found that many of the abnormally high and low individual farm premium rates were the result of purely accidental conditions while in other cases they reflected moral risks involving the managerial ability of the farm operator. Because of the shifting tenure it was considered neither possible nor practical to establish premium rates for individual farms which would properly reflect the risk of loss involved. The corporation therefore adopted the policy of charging a uniform premium rate per acre for all farms in a county, except extra hazardous farms, rather than charging a separate premium rate for each individual farm; such a rate, e.g. may be 1½ bushels per acre regardless of the average yield and coverage for the farm. "Under the plan of individual farm rates, farms with low average yields frequently also had low premiums. The premium for such farms expressed as a percentage of the coverage was little if any higher than for the better farms with higher average yields and more stable production, although experience indicated that losses were generally greater on such low yielding farms. Under the present plan of using a uniform rate per acre for the county, the premium expressed in percent of coverage for such farms increases substantially and it is expected that this will result in stimulating insurance substantially over better farms".

(v) As regards determination of average yields and coverages insurance is still largely based on individual farm yields. However such factors as the lack of individual farm data and the huge volume of work necessary to maintain individual farm records have constituted serious problems. It was also felt that there has also been a considerable amount of accidental production that has gone into individual farm production records without being properly evaluated, which has resulted in wide variation in yields from farm to farm without reasonable justification for such variation. As a result of these problems a plan was initiated on a limited basis for 1947 wheat programme whereby insurance coverages, in bushels, are determined for areas rather than for individual farms. "The areas may range in size from an entire

county down to an area as small in size as an individual farm, in order that all land in the area may be comparable from the stand-point of productivity. In addition recognition is given to individual farms of beneficial farming practices through differential adjustments in the insurance coverage. This is accomplished first by establishing a maximum coverage in the county, the weighted average of which cannot exceed 75% of the county check yield. Different levels of coverage below this maximum coverage are then determined by the use of established percentage factors". In demarcating such areas, and allowing appropriate coverages and premium rates for each area, consideration was given to the different farming practices that were carried out in the county or parts of a county. " Some of the practices that shall be considered are summer-fallow, irrigation, fertiliser, wheat grown immediately following an irrigated crop, etc. If all wheat grown in an area is grown under the same condition, there would be no necessity for establishing different practices since one practice would reflect the condition under which all wheat is grown. However where wheat is grown under different conditions different practices may be established to reflect the various conditions and amounts of coverage and premium rates for these different practices shall be established to adequately reflect the difference that results because of these practices".

In determining appropriate premium rates for various areas, the County Premium Rate determined by the Corporation is taken as basis. Taking into account loss experience under previous Crop Insurance Programmes, the location of recognised hail areas, presence of unusually light soils subject to erosion, flood and any other condition which would naturally affect risk of crop failure, appropriate premium rates are determined for such areas. In no area can the rate recommended for an area be less than 80% of the County Committee rate. And the weighted average premium rate for all areas within the county must exceed or equal the county premium rate.

6. The foregoing summary of the main features of the development of the actuarial basis should enable an appreciation of the lines on which allowance was made for the limitations of data and for experience of insurance as it was derived in course of the working of the scheme. In Indian conditions no such data of yields of a representative sample of farms in each county, as was available for a small period of year in the U.S.A. at the beginning of each extension of the Crop Insurance programme is at present available. It may suffice to state, therefore, that it seems to have been accepted in the U.S.A.,

(a) that a start could be made with individual farm data extending over a period of 5 to 6 years;

(b) that a period of 10 to 16 years was considered to be representative for the experience of different crop hazards for the different crops.

To illustrate the details of the actual basis used it may be simplest to assume that individual farm data for each farm was available for each year of such a representative period. Let us assume that in the t th year of the representative period consisting of m years, the actual yield per acre for the r th farm was x_{rt} and the area under the crop was a_{rt}. The average yield per acre for the r th farm will then be $(S\ x_{rt})/m = x'_r$, say. The insurance coverage for the r th farm under a 75% level plan of insurance will be $.75\ x'_r = x''_r$. There will be an indemnity payable, or crop loss in the r th farm in the t th year if $x_{rt} < x''_r$; otherwise the crop loss may be taken as 0. The crop loss for the r th farm in the t th year may be denoted by y_{rt} andit will be equal to 0 if $x_{rt} < x''_r$ and to $x''_r - x_{rt}$ if $x_{rt} > x''_r$. The average crop loss per acre for the r th farm will be equal to $(S\ Y_{rt})/m = Y'_r$ say. This will be the individual farm basis premium.

The total crop loss in the county during the t th year allowing for the acreages sown on different farms, will be $S_r(a_{rt}\ Y_{rt})$ and the crop loss per acre sown during the t th year, $S_r(a_{rt}\ Y_{rt}) / S_r(a^{rt}) = Y''t$.

The simple average of this was taken as equal to the average

c-rop loss of county during the representative period and may be denoted $y"' = S(y"_t)/m$. This will be the County Check Premium Rate.

The County Check Yield may similarly be obtained as follows:

The average yield per sown acre in the t th year = $S_r(a_{rt} X_{rt}) / S_r a_{rt} = x"'t$.

The simple average of these may be taken as the County Check Yield $X = S_t (x"'_t)/m$.

Even when individual farm rates were current, such rates were not based entirely on the experience of the farm only. The President's Committee on Crop Insurance (1937) was of the opinion that the premium rate should be determined on the basis of two factors - the loss experience of the individual farms insured and the loss experience of the county or area. The two factors were given equal weight as a rule. The adjustment of the premium rate by the county or the regional average wasfelt to be necessary because the experience of the 6 years, 1930-35, on one farm may not be representative of local risks. Incidentally, this process also served to average out to some extent the variations in the crop loss in the county. On this basis, with the symbols used above the premium for the rth farm would be $(y'_r + Y"')/2$. Thus assuming that the average premium rate for a county was 1 bushel, a farm having on its own experience a premium rate of 1.5 bushels, will utlimately have a premium rate of 1.25 bushels; while a farm having a premium rate of .5 bushels on its own experience will have a premium rate of .75 bushels.

NATURE AND EVOLUTION OF CROP INSURANCE ORGANISATION IN THE U.S.A.

7. The Federal Crop Insurance Corporation is a Government Corporation of and within the U.S. Department of Agriculture. It operates as one of the several branches of the Production and Marketing Administration of the Department. The oeprating set up of the Corporation is composed of the Board of Directors, the Manager and his staff and various field offices. The Amendment of the Crop Insurance Act in 1947 introduced several management and administrative changes. The Board will now be composed of five members appointed by the Secretary of Agriculture. Three of them will be employees of the Department of Agriculture including the Manager and the two

other members will be persons experienced in the Insurance business who are not otherwise employed by the Government. The Board will be appointed to hold office at the pleasure of the Secretary of Agriculture. Previously the Board was composed of three members, all of whom were employees of the Department.

The Manager is under the general supervision of the Board of Directors and the Administration of the Production and Marketing Organisation. He is the executive director of the Corporation's programmes and activities both in Washington and the field. In the Manager's office are three Area Directors who assist in the supervision of the field activities. The Central Office of the Corporation is located in Washington D.C. The office is responsible for development of plans for insurance, the insurance contract, administrative methods and procedures and for the executive direction of the Crop Insurance programmes. The Washington office also develops the actuarial basis for establishing the amount of insurance coverage and maintains control over the operations in the field.

There are three Branch Offices located in Birmingham, Chicago and Denver. The Branch offices maintain the official files of insurance contracts and related documents and perform the audit and accounting functions relative to these contracts. They accept applications for insurance, audit acreage reports, and premium computations, establish the cash equivalent of premiums, receive, audit and account for premium collections, audit loss claims and certify payment of indemnities, and furnish supplies and equipment to and pay for services rendered by State Crop Insurance Officials.

There are two different field services since 1945, one mainly for loss adjustment work and the other for selling insurance. Previously all the field administration in States and counties was performed by the State and County Committees of the Agricultural Adjustment Agency. In 1945 a new agency was created for loss adjustment, as it was felt that those who sell insurance should not determine the liability for loss.

At present in most States there is a State Crop Insurance Director who is primarily responsible for the Crop Insurance Programme in the State. His organisation is entirely responsible for the adjustment of losses; but he also shares

responsibility with AAA Committees for the success of the programme in the Stage. He approves farm yields and premium rates and accepts insurance applications for and on behalf of the Corporation. He also directs and supervises loss adjustment work and reviews all loss claims submitted in the State. Directly under him are district Supervisors who assist him in his work. There are also loss Adjustors who are paid only when they are actually employed.

The Field Service Branch of the Production and Marketing Administration is responsible for the work of selling insurance, after the development of programmes and procedures by the Corporation. This organisation continues to perform the following functions:

i) Establishment of the average yields and premium rates for individual farms under procedures of the Corporation and subject to the approval of the State Director;
ii) Organisation and administration of selling insurance;
iii) Determination of insured acreage;
iv) Collection of premiums.

In 1945, the Corporation through the AAA state and county committees appointed agents to sell insurance and paid those agents on a commission basis. In previous years insurance was sold in the county AAA offices and by the county and community AAA committees - men who were paid on a per diem basis. The commission is based partly on a flat amount per contract and partly on the size of the premium. The inclusion of the flat amount places emphasis not only on the volume of the premiums but also on the number of farmers insured.

The importance of the Loss Adjustment phase of the Corporation's work has been emphasised. "It involves one of the largest items of administrative expense, but the Corporation feels that if the losses are not adjusted correctly the payment of unjustifiable losses will easily amount to several times the amount of administrative expenses involved".

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'Saharavat/CSJ'

8. WORKING OF THE CROP INSURANCE SCHEMES DURING 1945-47

Crop planted and premium earned.

Commodity	Year	Contracts in force.	Contracts (number)	Farms (number)	Indemnities (number)	Insured acreage (1000 acres)	Insured Production (1000 bushels.)	Premiums (1000 bushels)	Indemnities (1000 bushels.)	Loss ratio (Indemnities Premiums)
Wheat	1945	14,390	12,836	19,494	2,207	1,099	8,042	1,084	472	0.44
	1946	305,428	225,246	292,050	45,382	9,224	84,180	9,226	5,367	0.58
	1947	360,408	-	-	-	-	-	-	-	-
Flax	1945	31,131	26,036	31,789	6,936	789	3,671	487	289	0.59
	1946	10,412	8,832	10,819	3,513	277	1,341	173	184	1.06
	1947	35,613	-	-	-	-	-	-	-	-
							(1000 lbs.)	(1000 lbs.)	(1000 lbs.)	
Cotton	1945	96,231	89,979	113,849	48,385	3,050	382,234	22,328	76,429	3.42
	1946	114,270	106,313	131,582	72,975	4,306	527,400	43,246	149,404	3.45
	1947	122,212					(1000 dollars)	(1000 dollars)	(1000 dollars)	
Tobacco	1945	12,587	12,068	13,824	1,829	54	-	677	530	.78
	1946	13,815	13,001	17,257	799	-	-	791	146	.18
	1947	14,676	-	-	-	-	-	-	-	-
Corn	1945	10,603	10,416	13,578	3,419	419	-	397	657	1.65
	1946	7,422	7,330	8,808	1,432	-	-	376	299	.80
	1947	6,868								

CSJ/DVS

APPENDIX B.

PROCEDURE FOR SUSPENSIONS AND REMISSIONS OF LAND REVENUE.

(Extract from the Land Revenue Rules (1921), Bombay Presidency, with commentaries and supplements compiled by F.G.H. Anderson, M.A. (Oxon), I.C.S., Revised Edition: 14-12-28).

Rules.

General Calamities.
(R.4966/24 of 1.5.29)

A. Suspensions of Consolidated (268) Land Revenue.

XXX. When the Collector has ascertained by local inquiries that owing to a partial or total failure or destruction of the crops throughout any tract on account of drought or any other cause, it will be necessary to suspend the collection of land revenue (or judi under the Gordon and Pedder settlements) assessed for agriculture (269) in any area, he is authorised especially when the tract is already impoverished or the previous harvests have been poor, to grant suspensions according to the scale given below to all occupants, agriculturists and non-agriculturists alike and to superior holders (267) of alienated land (R.9402-19) without inquiry into the circumstances of individuals: (R.1)

Classification of Crops.	Amount of assessment to be suspended.
4 annas (270) and under	The whole
Over 4 annas, under 6 annas	Half
6 annas and over	None

The normal crop, or average of satisfactory seasons is reckoned at 12 annas.

XXX-A. For the purpose of the suspension of revenue, annewaries are required only in seasons below the average or in good seasons, when there are suspended arrears.

The procedure for making the anna valuation is thus laid down in Government Resolution No:L.C.1145-B, dated the 24th June, 1927:-

(i) A Committee shall be formed for every village for which an anna valuation is to be prepared consisting of the Circle Inspector (as Chairman), the K, the Patil and two representative agriculturists selected by the Circle Inspector.

(ii) The Circle Inspector shall give not less than 3 clear days' notice of his visit.

(iii) The Committee shall meet in the month preceding the harvesting of the main crops and record its opinion as to what the anna valuation should be for each of them.

(iv) This opinion shall be signed by each member who (if the Committee is not unanimous) shall record his opinion over his own signature or mark.

(v) The opinion or opinions thus recorded shall be forwarded by the Circle Inspector to the Mamlatdar, who shall proceed to make a provisional decision.

(vi) The Mamlatdar shall fix a date by which the opinion or opinions referred to in section (v) above shall reach him.

(vii) If the opinion or opinions are not received by that date, he shall make his provisional decision on such other data as may be available.

(viii) The Mamlatdar shall publish his provisional decisions in the taluka kacheri and in the chawdis of all the villages concerned.

(ix) Any objection to the provisional decision of the Mamlatdar shall be made within 15 days from the date of its publication, and he shall take into account all objections which have been submitted to his superior officers, in person or by petition.

(x) Unless the Mamlatdar, on a consideration of the objections or for any other reason, sees fit to amend his provisional decision, such decision shall stand as his final decision. In any case where he amends his provisional decision, the amended decision shall be published in the same manner.

(xi) If the Collector revises the Mamlatdar's decision, this further decision similarly shall be published.

(xii) The Collector may select any field in any village for a crop test with a view to checking the accuracy of any anna valuation.

XXXI. Where the area affected is homogeneous (271) or whole villages are more or less uniformly affected, the suspensions should be announced for such tract or villages without detailed inspection. (R.2).

XXXII. The Collector shall cause the occupants and superior holders of alienated land whose revenue is suspended to understand distinctly that such suspension is provisional only, and that it will be decided subsequently whether the revenue suspended shall be ultimately remitted or collected.

B. REMISSIONS OF LAND REVENUE.

XXXIII. Remissions should be granted to occupants and to superior holders of alienated land in the manner explained below; there should be no inquiry into the circumstances of individuals. (271 a).

(i) Except as provided in sub-paragraph (ii), the grant of remission should depend on the character of the three seasons following that in which the assessment is suspended. The oldest arrears shall be remitted first (R.9402 - 19). Suspended revenue should be collected to the extent permissible

under the table given below. In accordance with this table, all suspended arrears which either (a) in Gujarat and the Konkan are in excess of one year's revenue or (b) in the Deccan are in excess of two years' revenue or (c) are more than three years old should ordinarily be remitted by the Collector:-

Anna classification of crop.	Proportion of assessment the collection of which would be justified.	
	Current.	Suspended arrears.
11 annas and over	1	1
8 annas and under 11 annas	1	½
6 annas and under 8 annas	1	.
Over 4 annas and under 6 annas	½	.
4 annas and under	.	.

(ii) In the tracts noted below, the grant of remission should depend on the character of the four seasons following that in which the assessment is suspended. In other respects the instruction in sub-paragraph (i) will apply except that the suspended arrears shall not be due for remission until they are more than four years old (R.4966/24 - 27th March, 1928.

(iii) The amount of suspended revenue to be collected with any particular instalment should be fixed by the Collector and announced before the collection of the instalment begins.

(iv) Cases in which owing to the impoverishment of a tract by a succession of bad seasons, or for any special reasons, it appears to the Collector desirable to remit or to collect suspended revenue otherwise (271b) than in accordance with the ordinary rule, should be reported through the Commissioner for the orders of Government.

XXXIV. When the assessment includes a separated rate (272) for water-advantages then, if the water fails to such an extent that no irrigated crop, or an irrigated crop not exceeding 4/6 annas can be grown, the whole/half of the portion of the assessment which represents the water-rate should in the case of all occupants and superior holders be remitted without suspension (R.5087-07, 5324-08). If such remissions are extensive, the Collector should first consult the Irrigation Officer of the district, and in case of difference of opinion should refer the case to the Commissioner. (7).

XXXV. When much land which would ordinarily be sown is left unsown because present or recentcalamity renders sowing impossible, the case is identical with that of failure of crops and should be similarly treated (Rs.8)

XXXVI. Suspensions may be granted to superior holders (including mewasdars (R. 1196-07) in accordance with the orders and the provision of sec.84A of the Bombay Land Revenue Code. Such grant entails the suspension 2nd remission of rent (other than crop share) payable by the inferior holders or tenants to the extent provided by that section, under which the Collector must also record his order (R.9).

II. - Local Calamities.

XXXVII. Relief on the occasion of local calamities, including the loss by fire or flood of harvested crops or other property (R.8507-11), should be determined by the investigation of individual cases. Before relief is granted the resources of the owner should be taken into account.

When the damage amounts to total or nearly total loss of crops, immediate remission is preferable to suspension (R.650-07, 2702-07, 8507-11). (R.(L) 1,2,3).

GENERAL.

XXXVIII. (R.8714-12). In order to carry out these rules it is essential that each autumn, not later than 1st October, each Sub-divisional Officer should obtain from each Mamlatdar a list of the villages in the taluka (printed lists should be available). This list should show against each village the full normal year's demand of fixed consolidated revenue in round figures, omitting annas. The next column should show the total amount of suspended revenue in each village. When these suspensions are not given uniformly to all occupants this fact should be made clear, together with the proportion (half, whole or more than one year's demand) which stands suspended. The next column should show the Mamlatdar's Final anna valuation for the village. For orders as to methods of valuation see R.3750-09, 7392-11, and 7760-12, para. 2, and 7773-B.27. A duplicate of these statements must also be sent to the Collector. (N)

XXXIX. Upon this information the Remission and Suspension Rules can be applied. If there is no suspended revenue, no orders about its collection will be needed. If the crops are plainly well above 6 annas there will be no suspension for current year. If they are unmistakable above 11 annas, the collection of the current revenue together with one full year's demand of suspended revenue could be ordered without further enquiry. But when the reported anna valuation is close to one of the critical figures,- say 5½ to 6½, so that perhaps suspensions may be needed in the current year, or 10½ annas, so that it is doubtful whether two years' dues can be demanded,- then a careful test of the valuation must be made. For this purpose the Sub-divisional Officer will, if necessary, go out on inspection in October (R.438-12). It is imperative that the crops should be seen before they are reaped, and the Sub-divisional Officer must ensure that the list reaches him in time for this to be done and should call for and proceed to act on the Mamlatdar's provisional

estimates should there be danger of his final estimates being received too late. He will select villages for test from the list so as to take a fair sample of the average condition of the taluka and should specially select villages for which the figures are critical. (N)

XL. Reprts of the extent and result of this test must be submitted weekly to the Collector. Duplicates of the original lists have been sent to the Collector, so that as he receives the results of the tests he can modify his estimate of the effect upon the probable demand and collections for the year. He can also see that proper progress is made in the tests. The Collector must see that reports required by Order XLIII below (F.2225-10) are submitted promptly. He must not wait until the last tests have been taken and the conditions of both kharif and rabi crops ascertained. If this first estimate requires material modification, he should intimate the revised figures later. These estimates can be made upon the schedules showing the normal demands, (or indeed upon the District Returns up to the end of July which will exhibit by Talukas the exact suspended revenue). He should not attempt accuracy to a single rupee and not delay while figures are collected, a task that should not be placed upon the subordinate establishment. (R.8714-12). (N)

XLI Only in cases where some special remission of water-revenue, or collection of the full revenue from irrigated holdings while other holdings are granted suspensions, has been ordered, will it be necessary to collect estimates (or actual figures) of the financial effect in detail from the villages concerned. The general intention of these orders is that the village should be the unit, not the aggregate 'khata' or the single field. (N)

XLII. The lists of suspensions and remissions should be published in the following manner. As soon as the statement for any village is sanctioned, the Mamlatdar should cause a copy to be sent to the village officers, who should be required to read and explain the orders to all the villagers and to post the copy in a conspicuous place in the villagers resort. The Collector's orders, if any, under section 84-A should be published and explained in the same manner. The village officers should be required at the same time to enter in the rayat's ledger (village form VIII-B) the remissions and suspensions which have been sanctioned, and in due course to

note in the rent column of the Tenancy Register (Form XII) for each hissa concerned the suspension or remission granted by the Collector's orders under section 84-A unless these orders are of a general character, when they may be recorded in a remark at the end of the Register. All Revenue Officers from Circle Inspectors upwards should satisfy themselves (by personal observation) that the publication has been made as directed and that any torn or defaced notice has been replaced and (by direct inquiry) that the remissions and suspensions and the Collector's orders under section 84-A have been read and explained to the villagers. The Circle Inspectors and other Taluka Officers must examine not less than 25 per cent. of the rayat's receipts and of the entries in the tenancy register within three months after the remissions and suspensions have been declared, giving special attention to receipts and entries affected by the orders. The District Officers should pay special attention to ensure that this examination has been properly carried out.

In alienated villages the same procedure should be followed throughout as far as practicable, and in those in which forms VIII-A and B and the Tenancy Register or corresponding forms do not exist, the Inamdar should be invited to provide every inferior holder who is entitled to remission or suspension and whose dues are not collected through the village officers with a combined demand and receipt form showing the remission or suspension sanctioned for each and the balance due for payment.

XLIII. The Collector, as soon as he issues his orders, should report to the Commissioner his proceedings as regards both suspension and remission of land revenue, stating fully the reasons for these orders and the extent of their application, with other relevant particulars.

NOTES.

269. Therefore these rules do not apply to non-agricultural revenue.

270 For remarks on anna-valuation, see R.7392-11. It is not an easy matter to determine a true anna-valuation for the whole of the crops of a village. If on one acre the crops are 4 annas and on 500 acres the crops are 8 as., then the average value is certainly not 6 as. Even in estimating the average anna-value of one crop, such as rice, the total area of the crop, and how much has failed totally, and how much in lessdegree, must be

considered. Error in appraising one crop may have less effect on the village average than neglect to 'weight' the average correctly.

(ii) An exact method of calculation is this:- Suppose 1,000 acres occupied and assessed in the village. The average unsown (rotation-fallow, etc.) in ordinary years is 100 acres. The crops for the current year are:-

	ACRES	ANNA VALUE
Unsown, rain being very short	250	Nil
Juvari	120	5
Bajri	86	7
Rice	64	1
Cotton	280	14
Gram	40	10
Wheat	160	10

The average will then be the sum of 250 x 0 + 120x5 + 86 x 7 + 64 +280 x 14 + 200 x 10 divided by 900, the normal cropped area; 7,186 divided by 900 = Total anna-valuation of the village 7.98 or 8 as. Since in this instance the more successful crops are late crops, the Collector will probably postpone the instalment till after rabi harvest.

(iii) Government have ruled that fluctuations in prices are not to be taken into account (R.11908-18). This is an additional measure of leniency, since usually the worse the season, the higher the prices of such produce as is garnered.

(iv) Grass intentionally kept for cutting or grazing or interspersed with babul for the sake of the future return from timber and the present yield of pods, etc., is a crop. No doubt, it is not a very profitable crop in most cases , but it ordinarily suffices to meet the assessment. Perhaps it will be fair to estimate that when the value of the grass and other products is just about equal to the assessment, then we should treat it as a 6 anna crop, which does not entitle to remission or suspension, but on the other hand is not good enough to bear any further charge for suspended revenue. If the growth of grass has been very good and fodder is scarce so that the grazing value is high, then the valuation of this crop would go above 6 as. The question to be asked in this case therefore is whether the value of the grazing or cut grass, together with babul pods or anything else produced, is equal to the assessment or substantially more or less.

This method has been fully endorsed by the orders in R. (L.C.1145-B), dated 24th June 1927), though there are inaccuracies of terminology in paragraph 4 of that resolution. This inaccuracy will be seen by carefully studying paragraph 8 of the report of the Committee (of which the writer

was a member). The vital point to remember is this:-

(a) " land of average classification" means (as a vague generality) land of about 8 annas classification value.

(b) In village Nastipur wheat is grown only on good soil for which the average classification in Nastipur is not 8 annas but 14 annas. Therefore the standard output for an acre of Wheat in Nastipur is not the standard output for land of 8 annas but for land of 14 annas. Once this is firmly grasped, the error of the wording of the Resolution stands clearly out.

(v) Standing in a field and appraising the anna value of its crop, every one must have in his mind some definite standard by which he makes his estimate. If in one taluka the ordinary output of rice is 20 mds. and in another taluke it is only 10 mds. an officer accustomed to the first taluka will, if making a valuation in the second, be very liable to put a crop down as only 6 annas when it is really 12 as. It would be half what he has been accustomed to see; still it is the full normal crop of the second taluka. In the best possible year, the outturn of the best land will be many times that of the worst land; and yet the small crop found on the worst land will for that land be a 12- anna crop or more. It is evident therefore that unless the classification value of the land and the normal good crop on land of that class are both known to the valuer, no trustworthy estimate can be made.

(vi) Very serious errors would occur if different officers valued the crops of a village in different years according to widely different stands. Mamlatdar A will put down the crop as 10 as. in 1919. But if he does not say how may maunds per acre he considers to be the full crop of 12 as., it is perfectly possible that in 1922 Mamlatdar B seeing an exactly equal crop on the same field will class it at 6 as., becuase B thinks that the normal fair output is much higher than A considers it be. It, therefore, seems essential to good valuation that each officer should first put down in maunds per acre what he considers to be the fair normal yield of that crop on land of the best class in that village. If he puts down 20 mds. as the produce in his judgement of land of 16 annas classification, and the field before him is of 12 annas classification, then it ought to produce 15 mds. in the normal year with a 12 anna crop. If the crop is actually only 10 mds. then its valuation is 8 as. If such valuations are put down when the crop is not reaped and removed, and any officer desires

to test the valuation, he can alwa s do so by actually cutting and weighing the produce of a small area in any case where the valuation is challenged by the people, or appears to him to be doubtful. There is no doubt that the revenue staff have not the time to carry out extensive tests of this kind during the short time which is available between the maturity and harvesting of a crop. But if in any year reckless statements are set about as to the failure of crops, or if the revenue officers are believed to have greatly overvalued them in misconceived zeal, at any rate half a dozen tests taken in different directions and typical villages worked out in full detail, would suffice for illumination. But the fundamental necessity is that it should be known to the valuing officer and to the testing officer and to any other critic exactly how many maunds per acre he had in view as the full normal crop. There are, moreover, various reports and publications of the Agricultural Department with which such estimates could be compared. A continuous record checked and corrected by tests and accumulated experience would then grow up in each taluka. The Agricultural Department have a table of Standard output for each taluka.

(vii) Some land bears two crops (kharif and rabi, such as rice and val): such land was classed and assessed for those capacities, and in good average years would bear a 12- anna kharif and then a 12 anna rabi crop; but in a bad year it might have 6 annas kharif and 2 annas or less of rabi. We should put down the anna valuation of each such crop, and also put the area down twice; e.g. 1 acre of 6 anna rice followed by 1 acre of 2-anna val. If we put down as 1 acre bearing 6 annas + 2 annas or a total of 8 annas crop, we have very plainly overrated it, since the land is assessed to bear 12 + 12 as its full ordinary crop and not 12 only. Therefore, for all second crop lands, repeat the area twice and give the anna valuation of each crop (or failed crop).

If this conception is admitted, then the ideal form for working out the anna-valuation of a village would be as follows, It would be difficult to make all these estimates and calculations for every village and yet no anna-valuation of the crops of the village which omitted any of these considerations could stand cross examination. Whenever such a calculation is made,it should be permanently preserved.

VILLAGE OF NASTIPUR - 1922.

N.B. Cols. 2 and 4 would be standing figures, with slight alteration in col. 4 as the area devoted to that crop changed.

Crop	Normal yields (12 as. crop on land of 16 as classification.	Area sown.	Average classification value of that land	Estimated yield this year	Anna value	Total annas x acres
Normal fallow	..	100	..	..	..	..
Unsown	NIL	150	..	NIL	NIL	NIL
Grass	(6 as.pays the	80	..	4 as	4	320
Juvari	12½ massess-	120	10	6 mds.	9	1,080
Bajri	10 m.ment.	86	12	3	4½	409
Rice	40 m.	64	8	2	1¼	80
Val	9 m.	37	8	1	2½	92
Other pulses	8 m.	63	12	1	2	126
Cotton	4 m.	180	12	3	12	2,160
Wheat	8 m.	100	14	3	5	500
Gram	4 m.	20	14	1	3½	70
Linseed(second crop)	3 mds.	25	12	3	16	400
Gross Area:		1,025				925)5237 (5.66
Net valued area.		.925				

The formula for each area or the average of the area under the crop is: $\frac{(1)\ 192}{(2)\ \text{Soil-annas of the area under the crop}} \times \frac{(3)\ \text{Actual procure.}}{(4)\ \text{Full standard produce (16 annas soil in a 12 anna season).}}$

(4) Can be supplied as a constant by the Agricultural Department.

(2) Is to be estimated for each crop: i.e., for jowari the soil-valuation in annas of the whole area under jowari must be ascertained. The most exact method of doing this upon the crop-register of a village is this:-

$\frac{\text{Full assessment of the jowari area}}{\text{Acres of jowari x maximum dry crop rate}}$ = anna - value of soil under jowari.

Mr. Ranchodlal Manohardas, formerly Circle Inspector at Godhra, has on this formula calculated a table for all yields up to 20 annas. (For most of this Note we are indebted to Mr. R.G. Gordon, I.C.S.)When more than usual area is sown the calculation is the same: the increase in column 7 will yield a rather higher valuation; if the sown area exceeds the normal, still the full average 100 acres of normal fallow should be deducted to get the nett valued area.

Government also agreed to a scheme for improving the standard table of outturn of crops, and to increase the number of rain guages. But for want of funds no action has been taken.

271. The principal difficulty in applying the term "homogenous is in respect of irrigated land. It can hardly be said that land irrigated by wells is homogeneous with unirrigated land. The general rule is that when fixing the anna-valuation of the crops for a considerable tract such as a taluka, attention is paid only to the dry crop (R.9952-11). But if it were specially necessary to determine whether suspensions or remissions should be granted on irrigated lands regarded as "a homogeneous tract" distrinct from the dry crop lands, the orders are that each holding in the sense of a single plot of land held by one holder (i.e., the Survey Number if undivided, or the sub-division) should be treated individually. If more than half is irrigable it should be trated as irrigated: if less than half, then as dry crop. Next the valuation of the crops should be based rather on the general state of the water supply and level. A man who has a well full of water but has not used it hardly deserves compassion. A full utilisation of the existing facilities is presumed. Therefore detailed inspection of the crop of each irrigated holding is quite un-necessary. We should ascertain (a) which are the irrigated holdings, and (b) what is the general state of water over the tract, and give suspension and remission orders accordingly. These orders might be of course be quite different from the dry crop orders (R.765-06,650-07,219-14).

When we are not dealing with a tract, such as a taluka or mahal, but the question is only as to a group of say 10 villages, then we are dealing with a Local Calamity and Order XXXVII applies. When tank or well irrigation has completely failed, either in respect of a single tank through its bursting, or local absence of rain, or in respect of many such sources through short rainfall, then a special remission or suspension on the irrigated holdings affected is countenanced under order XXXVII.

271A. This puts to rest an old controversy. There was of old a strong inclination to draw distinctions between "agriculturists" and "sawkars" (i.e., between those who combined the function of landlord (drawer of the unearned rent and cultivator in one person, and those who were " renters" only). Another line, of distinction was between "rich" and "poor". In R 4520-09 there is a long discussion of a sort of campaign conducted against "sawkars" in Kaira by the late Mr. A.L. Wood, I.C.S.

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* Sholapur District.
Bijapur District.
Ahmedanagar District (excluding Akola, Kopargaon and Sangamner Talukas) Indapur and Bhimthadi talukas and Sirur and Dhond Petas of Poona Distt. Gadag, Ron and Navalgund Talukas and Mundargi and Nargund Petas of Dharwar District.

271b. Owing to the peculiar impoverishment of certain Kanara tracts buried in Forests, all arrears of the current year's assessment on land not ploughed were remitted. All arrear on cultivated land exept half of last year's suspended revenue were also remitted. Power was given to the Collector to remit next year half the consolidated revenue on fallow (unploughed) land. Public notice was also given that unplough -ed land might be resigned without liability for arrears (R.450-21.)

272. These separate rates are the Patasthal, Himayat or tank water, Dhekudiat, and Akasia. Motasthal on well irrigation is not usually an extra rate, but only a rise (or chad) in classification which is not separable from the Land Revenue. The separate or separable water rates are usually distinguished in V.F.I. or a statement supplementary thereto, such as the Himayat statement. These rates were discussed in an Appendix now transferred to the Survey Settlement Manual.

(ii) Akasia is a rate for capacity to grow rice on rain water only. When the rain is insufficient and crops other the rice are grown, the Akasia portion is to be remitted (R.5475-05.)

(iii) A water rate not assessed as land revenue but optionally contracted for by the holder, as for a supply of canal water, is not land revenue and its remission, etc., is not regulated by these rules.

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